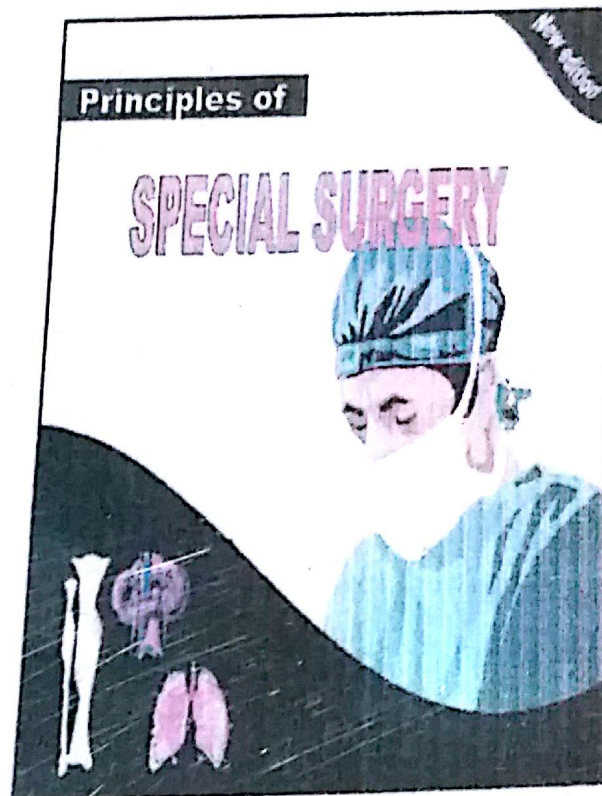


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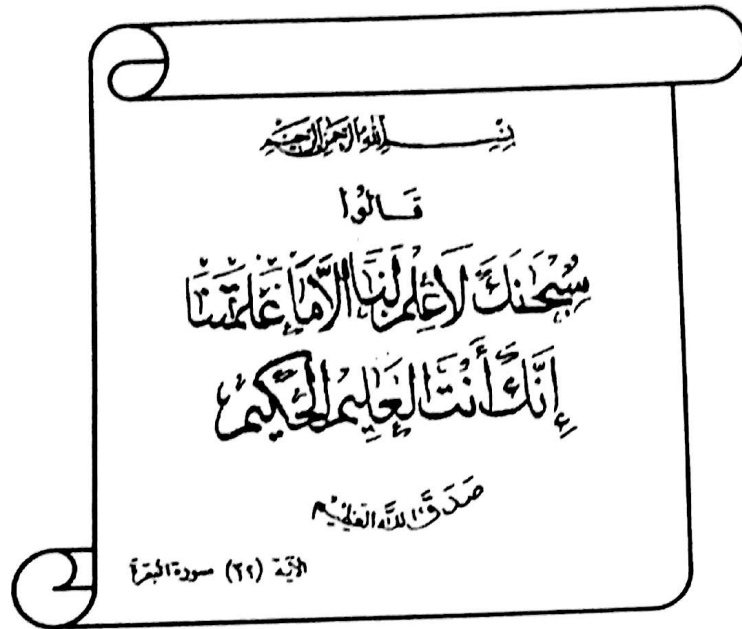
SPECIAL SURGERY



Dr. WAEL METWALY

VISIT...

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اللهم زدني علماً واجعل هذا العلم نافعا لكل من يدرسه

اللهم ارزقني من هذا العمل رضا ومغفرة وعقداً من النار ما حيت وبعد الممات

اللهم اجعل هذا العمل صدقة جارية لا ينقطع لها عملي بعد موتي

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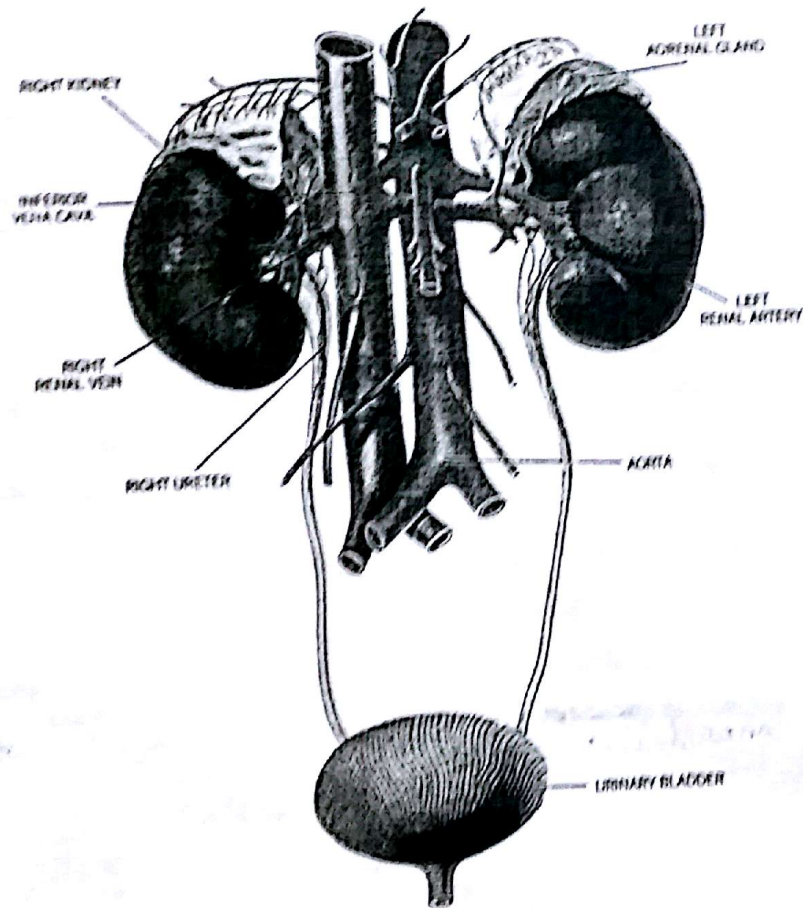
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With my best wishes

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URINARY TRACT DISEASE



Symptomatology of urinary tract

SYMPTOMATOLOGY

1. PAIN

SITE	KIDNEY	URETER	BLADDER	URETHRA	
				Post.	Ant.
	Dull ache Renal angle	Colicky Along the ureter	Dull ache	Dull ache	Burning
			Supra-pubic region	Perineum	Local penile
RADIATION	To renal point (upper outer quadrant of abdomen)	To inner side of the thigh & external genitalia	Tip of penis	Tip of penis	NO

2. HEMATURIA (See page 5)

3. RETENTION OF URINE (See page 7)

4. PYURIA

It means presence of **pus** in urine. It may be microscopic or gross

5. NECROTURIA

It means presence of a piece of **necrotic tissue** in urine
They represent necrotic tissue of cancer bladder

6. PHOSPHATURIA

The urine looks turbid due to **phosphate crystals** in urine.
Adding few drops of acetic acid will lead to clearance.

7. CHYLURIA

The urine looks milky due to **chyle** in urine.
Adding ether will lead to clearance.

8. PNEUMATURIA

It means presence of **air** in urine. It may be due to a colo-vesical fistula & infection with gas forming organisms.

9. FREQUENCY

It means that the amount passed each time is less than the capacity of normal bladder which is (300 - 400 ml).

It may be $\rightarrow$

- Frequency by **day** occurs with stone bladder.
- Frequency by **night** occurs with senile enlargement of prostate S.E.P.
- Frequency by **day & Night** occurs with cystitis

10. DIFFICULTY

It means difficulty due to some **obstruction** in the urinary pathway
e.g. in patient with S.E.P, the urinary stream is weak.

11. DYSURIA

It means **pain** as discomfort on urination

12. URINARY INCONTINENCE

1. True Incontinence

It is urine loss without warning 2^y to defective urethral sphincters,
e.g., Ectopia vesicae, Epispadias.

2. Stress Incontinence

It is urine loss in association with physical strain, e.g., coughing & straining.
It is common in multipara women with weak muscle support of the bladder neck

3. Overflow (false) Incontinence

It is loss of urine due to chronic urinary retention.

4. Enuresis

It is bedwetting at night. It is physiologic condition during 1^st 2 - 3 years of life.

5. Fistula

It is an abnormal communication between urinary & gynecological organs
e.g. Vesico-vaginal & Uretro-vaginal fistula.

HEMATURIA

DEFINITION

It means passage of blood in urine.

TYPE

1- **Frank hematuria** = Red urine.

2- **Microscopic hematuria** = The blood is only detected chemically.

3- **Painful or painless** e.g. Painful with cancer urinary bladder (squamous)
or painless with cancer urinary bladder (transitional)
& hypernephroma.

DD OFF RED URINE

It may be 2^y to beet roots ingestion or drugs as Rifampicin or hemoglobinuria



CLASSIFICATION

- 1- **Total hematuria** : It presents all over the stream of urine & it indicates pathology in kidney or bladder
- 2- **Terminal hematuria** : It presents at the end of micturition & it indicates pathology in bladder neck, post. urethra or prostate.
- 3- **Initial hematuria** : It presents at the beginning of micturition & it indicates pathology in ant. urethra

CAUSES OF HEMATURIA

A- General causes

Thrombocytopenic purpura, hypertension, Vit k deficiency ... etc.

B- Local cause

1- Renal cause :

- Congenital : e.g. Polycystic kidney.
- Traumatic : e.g. Rupture kidney.
- Inflammatory : e.g. Acute glomerulonephritis.
- Stone
- Neoplastic lesions.
- Vascular e.g. Infarction of kidney.

2- Ureteric causes :

Traumatic, stone & neoplasm

3- Bladder causes :

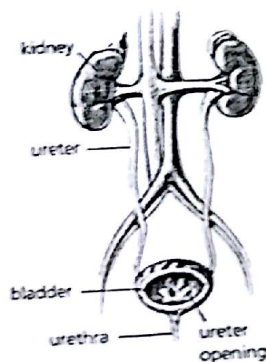
Cystitis, stone & neoplasm.

4- Prostatic causes :

Prostitis, S.E.P & neoplasm.

5- Urethral causes:

Urethritis, stone & neoplasm.



DIAGNOSIS

A- History we have to find

- ① The possible aetiology .
- ② The source of blood.
- ③ The associated symptoms as pain, frequency, difficultyetc.

B- General examination

- ① Vital signs especially for hypertension.
- ② Presence of pallor if severe hematuria i.e. anemia
- ③ Signs of uremia as drowsiness, dry tongue, diarrhea, dry skinetc.

C- Local examination

- ① Abdomen for renal swelling, tender renal angle
- ② Ext. genitalia for blood at tip of penis.
- ③ Rectal examination for S.E.P, cancer prostate ... etc.

INVESTIGATIONS

According to suspected cause.

TREATMENT

RETENTION OF URINE

DEFINITION

Inability to pass urine inspite of a full bladder

TYPES

- 1- **Acute** : Painful retention of urine .
- 2- **Chronic** : Retention with over flow .
- 3- **Acute on top of chronic** : e.g. on top of S.E.P or cancer bladder.

1. Acute retention

CAUSES

A- Obstructive causes

- ① Urethra : Rupture, stricture & stone
- ② Prostate : Prostitis, S.E.P & carcinoma .
- ③ Bladder : Stone, B.N.O & carcinoma

B- Post - operative causes

- ① Rectal & anal operations
- ② Gynecological operations
- ③ Following urethral instrumentation e.g. urethroscopy

C- Neurological causes

- ① Spinal cord injuries.
- ② Nervous disease as tabes dorsalis.
- ③ Hysteria.

D- Gynecological causes

- ① Retro-verted gravid uterus
- ② Large cervical fibroid .
- ③ Ovarian tumors.

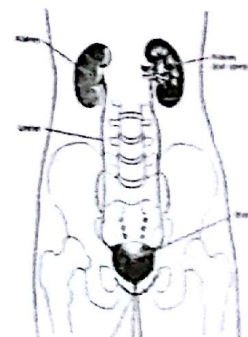
CLINICAL PICTURE

(The patient has not passed urine for some hours & is unable to do inspite of presence of desire)

- **Inspection** : Supra-pubic pyriform mass .
- **Palpation** : Tender mass .
- **Percussion** : Dull above symphysis pubis .

DD

Anuria = Resonant bladder on percussion + no desire .



MANAGEMENT

1- Conservative treatment (Tried at 1st)

- An analgesic is administered .
- The patient is advised to get out of bed .
- Warm baths are advised & good hydration.

N.B: Advise patient to try to micturate in front of running water

Except : - If patient is with organic obstruction
i.e. acute on top of chronic

- Injection of para-symphomimetics as **carbacol** is given.

2- IF conservative ttt is failed

- Catheterization by Foley's or Nelton catheter.

3- IF catheterization is failed

- A **percutaneous supra-pubic catheter** can be inserted under local anesthesia.

Never Send patient home but investigate him then treat the cause.

Chronic retention

DEFINITION

It is gradual distention & dilatation of the bladder with residual urine from chronic obstruction.

CAUSES

(**Organic obstruction**)

such as ① SEP.

- ② Cancer prostate
- ③ Urethral stricture.

CLINICAL PICTURE

The patient is **unaware** of it & there is no abdominal pain with residual urine

MANAGEMENT

The blood urea is estimated
before any attempts to relieve retention

So IF blood urea < 100 mg % :
Treated as acute retention

But IF blood urea > 100 mg % :
Treated by gradual decompression by catheterization to avoid the reactionary hyperemia & bleeding from the kidney due to sudden decrease of intra-vesicle pressure.

ANURIA

TYPES

I- **Pre-renal anuria** Due to hypovolemic shock → Hemorrhage, burn or fluid loss.

II- **Renal anuria** e.g. Acute renal failure A.R.F

III- **Post-renal anuria** e.g. **Calcular anuria**

Calcular anuria

DEFINITION

It is a serious condition in which the anuria is due to **calcular** obstruction in the ureter.

AETIOLOGY

- 1- Calculi obstructing **both** ureter.
- 2- Calculi obstructing **one** ureter of the only functioning kidney.

CLINICAL PICTURE

[The patient is usually with long history of calcular disease]

Symptoms

- 1- **Stage of onset** : Sudden onset of renal colic from stone passing in ureter.
- 2- **Stage of tolerance** : The patient feels comparatively well due to dilatation of ureter above the obstruction.
- 3- **Stage of uremia** : Due to pressure inside the renal pelvis, more than systolic BP so filtration is stopped .

Signs Signs of uremia + tender kidney with overlying guarding & rigidity + resonant bladder on percussion.

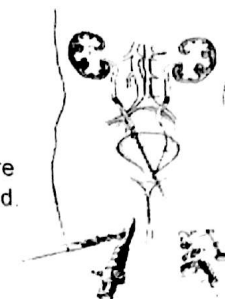
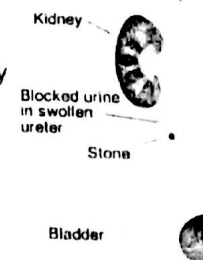
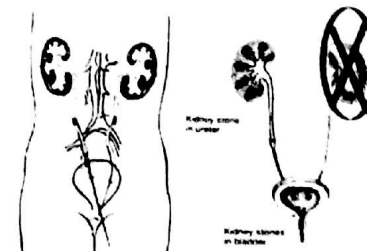
INVESTIGATIONS

- 1- **Insert a urinary catheter** to check that the bladder is empty.
- 2- **Plain X-ray** : (Not helpful) as the stone is small & the kidney is distended
- 3- **Abdominal U/S** : more useful.

TREATMENT

A- Cystoscope is passed & bilateral ureteral catheters are passed beyond the stone, then the urine is drained.

B- If ureteric catheterization is failed,
A percutaneous nephrostomy
Is performed, then the stone is extracted later.



INVESTIGATIONS OF THE URINARY TRACT DISEASE

A- Laboratory investigations

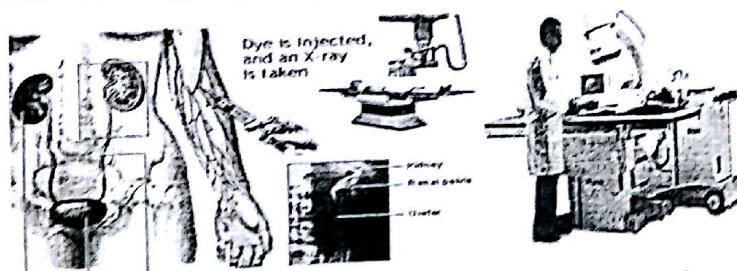
- 1- **Urine analysis** For (a) Chemicals as RBCs, pus...etc.
(b) Culture for micro-organism.
(c) Cytology for malignant cells.
- 2- **Blood urea** Normal = 20 - 40 mg %
- 3- **Serum creatinine** Normal = 0.2 - 1.5 mg %.

B- Radiological investigations

1- Plain x-ray

- Shows (a) Soft tissue shadow of kidney if enlarged
(b) Obliterated psoas muscle shadow by renal swelling.
(c) Radio-opaque stone or calcifications of urinary tract.

2- Intra-venous pyelography (I.V.P) urography I.V.U



- **THE DYE** Urographin which is concentrated and excreted in urine
- **THE MECHANISM** Normally the dye appears in pelvi-calceal system after 5 min. & completely excreted in 1 - 1.5 hour
- **CONTRAINDICATED** with urea > 100 mg % or urinary tract infection.

3- Infusion pyelography

If blood urea > 100 mg % (Urographin) is added to equal volume of saline & then infused very slowly over period of 100 min. I.V.

4- Ascending pyelography

Through cystoscope & bilateral ureteric catheter.

5- Cystography

Either ascending or descending.

6- Urethrography

7- U/S, CT scan & MRI.

8- Endoscopy to visualize & to take a biopsy

9- Urodynamic studies very useful in patient with obstructive uropathy

10- Radioisotope scanning.

Congenital anomalies of urinary tract

CONGENITAL ANOMALIES

CONGENITAL ANOMALIES OF THE KIDNEY

1- Anomalies of number

- 1- **Unilateral agenesis.**
- 2- **Bilateral agenesis.**
- 3- **Supernumerary kidney**



2- Anomalies of volume & structure

1- Multicystic kidney

It is unilateral disease, represented by lobulated mass with absent or atretic ureter. complicated by malignancy. IVP shows no excretory function treated by nephrectomy.

- 2- **Polycystic kidney** (See page 14)
- 3- **Solitary (simple) cyst** (See page 15)

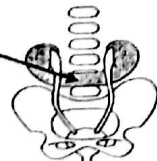
3- Anomalies of ascent

- **Ectopic kidney** (See page 16)



4- Anomalies of shape & fusion

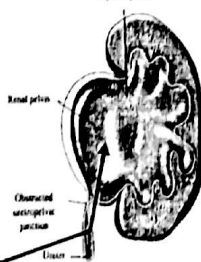
- **Horse shoe kidney** (See page 18)



5- Anomalies of renal vasculature

- 1- **Aberrant, accessory or multiple vessels.**
- 2- **Renal artery aneurysm.**
- 3- **Congenital A/V fistula (rare)**

Hydronephrosis



6- Anomalies of renal pelvis

1- Bifid pelvis :

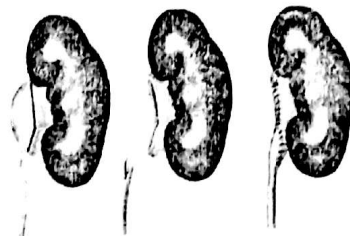
- The commonest anomaly of renal pelvis
- Discovered accidentally at left side mainly.
- It is considered the seat of infection, stone formation or hydronephrosis.

2- Pelvi- ureteric junction obstruction :

- It is the common cause of hydronephrosis of children & adolescent.
- It is bilateral in 15 %

- Treatment :

By **(Androsen - Hyne's)** operation
This entails excision of proximal part of ureter & redundant pelvis.



CONGENITAL ANOMALIES OF THE URETERS

1- Anomalies of number e.g. double ureter

Which is usually associated with supernumerary kidney or bifid pelvis. It may be complete or incomplete

2- Anomalies of termination e.g. Ectopic ureter

Which is usually associated with double ureter.

3- Anomalies of structure

e.g. atresia, hypoplasia or megaureter.

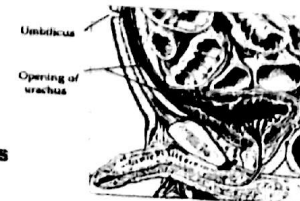


CONGENITAL ANOMALIES OF THE BLADDER

1- Patent urachus

- It is a congenital urinary fistula developed from patent median umbilical ligament.

- Treatment : Excision of urachus



2- Bladder neck contracture Marion's disease

CAUSES

- Congenital : Hypertrophy of muscle at bladder neck
- Acquired : Bilharzial fibrosis (B.N.O.)

TREATMENT

Excision of a triangular portion of bladder through a cystoscope but it is complicated by

- ⇒ In female : Incontinence
- ⇒ In male : Retrograde ejaculation.

3. Extrophy Ectopia vesica (See page 19)

CONGENITAL ANOMALIES OF THE URETHRA

1- Phimosis

The prepuce becomes contracted over the glans "Pin hole" meatus

2. Paraphimosis

The prepuce becomes tightly retracted beyond the base of the glans. If the retraction not relieved → gangrene of penis.

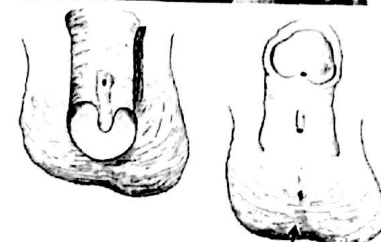


3. Epispadias (rare)

- The urethral orifice opens on upper surface of penis

- TYPES 1- **Complete** : Associated with ectopia vesicae

2- **Incomplete** : Associated with normal bladder



4. Hypospadias (See page 20)

- The urethral orifice open on upper surfaces of penis

lower 13

1- Polycystic kidney

AETIOLOGY

Failure of fusion of the part developed from :
The "mesonephros" i.e collecting tubules
& The "metanephros" i.e convoluted tubules

1. Autosomal dominant (Adult type)

INCIDENCE

- Common than autosomal recessive type.
- 30 – 40 % associated with intra-cranial aneurysm
- 50 % Associated with cyst in liver & lung.

PATHOLOGY

- **Site** : Both kidneys are affected.
- **N/E** : Grape like appearance.
- **Cut section** : Shows multiple cysts of variable sizes containing coagulated blood, with normal compressed renal parenchyma & separated renal pelvis

CLINICAL PICTURE

- **Age of presentation** : 30 – 40 years.
- **Symptoms** :
 - ① **Uremia** is the commonest presentation
If bilateral renal failure occur.
 - ② Heaviness pain
 - ③ Hematuria (25 %) from ruptured cyst in renal pelvis.

A- Signs :

- ① Signs of uremia
- ② Palpable renal mass
- ③ Hypertension (75 %) due to ↑ Renin angiotensinogen

COMPLICATION

Infection → Pyelonephritis (cause of death).

INVESTIGATIONS

A- Laboratory investigations

Urine analysis, blood urea
& serum creatinine

B- Radiological investigations

- 1- **I. V. P** : (**Spider leg appearance**)
Elongated, stretched
& wide calyces.

- 2- **U/S & CT scan** (diagnostic)



Polycystic Kidney



TREATMENT

A- Conservative except if complicated

- The patients drink excess water.
- They should have a low protein in diet.
- Hypertension should be controlled.

B- Surgical Rovsing's operation

- Puncture the superficial cysts to save the remaining renal parenchyma from compression & to relieve pain or hemorrhage.

N.B: Nephrectomy is contraindicated as the disease is bilateral

2. Autosomal recessive (Infantile type)

It may be presented by

- 1- Enlarged kidneys which lead to obstructed labor.
- 2- Renal failure, renal rickets & uremia in infant.
- 3- Pulmonary hypoplasia "cause of death"

2- Solitary (simple) cyst

AETIOLOGY

It is not clear whether congenital or acquired
as it may be related to renal tubular obstruction.

CLINICAL PICTURE

There are **no** pathognomonic symptoms or signs
The condition may be

- ① Asymptomatic
- or ② Pain in flanks or back usually dull in character,
- or ③ Hemorrhage or infection lead to acute symptoms.

INVESTIGATIONS

The main value is to DD it from neoplastic tissue
SO **U/S & CT scan** is diagnostic.

TREATMENT

A- Asymptomatic Just follow up

B- Symptomatic

1. **Percutaneous needle aspiration of fluid**

Replaced by 95 % alcohol as sclerosant then examine the fluid for malignant cells.

2. **Kirwin's operation**

Deroofing the cyst + packing the cavity with perinephric fat

3. **Partial nephrectomy :**

If containing blood or show papillary growth for fear of malignancy



3- Ectopic kidney

DEFINITION

Abnormally situated kidney (arrested)

PATHOLOGY

- **Site** : Arrested in pelvis or iliac fossa
- **Short** ureter
- **Renal artery** arises from lower aorta or common iliac artery

CLINICAL PICTURE

1. Asymptomatic
- or 2. **Tender mass** in pelvis or iliac fossa
- or 3. **Complications** as infection & hematuria

INVESTIGATION

A. Laboratory investigations

Urine analysis, blood urea & serum creatinine

B- Radiological investigations

1- I. V. P :

Shows **short ureter**



2. Aortography : Show the renal artery arises from the lower aorta or common iliac artery

3. U/S & CT scan (diagnostic)

TREATMENT

A. Asymptomatic No treatment

B. Symptomatic Treat the complications.

N.B.: Mobile kidney

Nephroptosis

DEFINITION

Mobile kidney shows excess mobility beyond normal range.

(The kidney is normally mobile with respiration about 1 vertebra up & down)



AETIOLOGY

A. Predisposing factors

- ① Heavy kidney weight, i.e. renal mass
- ② Shallow renal fossa especially with tall persons .
- ③ More common at Rt. side (due to presence of liver).

B. Precipitating factors

- ① Rapid loss of weight.
- ② Trauma to the loin.
- ③ Generalized visceroptosis.



PATHOLOGY

- **Site** : present in loin or pelvis.
- **Long kinked** ureter
- **Renal artery** arises from lower aorta or common iliac artery

CLINICAL PICTURE

- 1- Asymptomatic
- or 2- **Kinking of renal pedicle** : Recurrent renal colics & tender mobile mass in loin or Iliac fossa.
- or 3- **Complications** as hydronephrosis, infection & hematuria.

INVESTIGATIONS

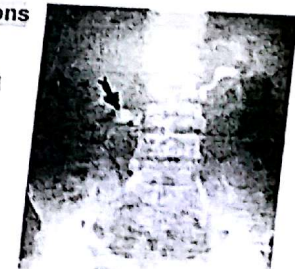
A. Laboratory investigations

Urine analysis, blood urea & serum creatinine

B- Radiological investigations

1- I. V. P :

Shows **long kinked ureter**



2. Aortography : Show the renal artery arises from the normal level at aorta

3. U/S & CT scan (diagnostic)

TREATMENT

A. Asymptomatic No treatment

B. Symptomatic
Nephropexy

(By suturing the post, renal capsule to quadratus lumborum muscle)



4- Horse shoe kidney

DEFINITION

The most medial lower poles of both kidneys fuse & so the kidneys fail to ascend completely i.e. Anomaly of ascent, fusion & rotation

N.B.: The adrenal glands

are being developed in their normal place

CHARACTERS (PATHOLOGY)

- ① It occurs early in embryonic life when the kidneys lie low in the pelvis
- ② Ascent of the horse shoe kidney is arrested by the isthmus being blocked against the inferior mesenteric artery (L₄)
- ③ Normal rotation cannot occur & each renal pelvis lies on the anterior surface of its kidney
- ④ The lower poles lie near to mid line
- ⑤ Ureters are kinked by the isthmus (Flower vase)
- ⑥ The blood supply is usually abnormal (from iliac artery)

CLINICAL PICTURE

- **Age of patient** : Any age
- **Symptoms** : 1/3 of patient may be asymptomatic & 2/3 of them are represented by stone, hydronephrosis, infection & hematuria.
- **Signs** : Tender fixed mass below umbilicus

INVESTIGATIONS

A Laboratory investigations

Urine analysis, blood urea & serum creatinine

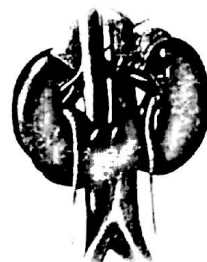
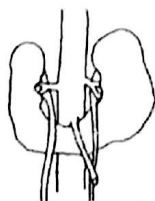
B- Radiological investigations

1. I.V.P :

Shows the **lower poles** point medially



2. U/S & CT scan (diagnostic)



TREATMENT

A. Asymptomatic Just follow up

B. Symptomatic

Isthmusectomy (rarely done) & treatment of symptoms

5- Ectopia vesica

Extrophy

DEFINITION

It is a ventral defect in uro-genital sinus leads to deficiency of ant. wall of urinary bladder

INCIDENCE

1 : 50.000 live births (Male > female)

CLINICAL PICTURE

- Absent ant. wall of the bladder & ant. abdominal wall from umbilicus downwards.
- Widening of symphysis pubis → **Waddling gait**
- It is associated with indirect inguinal hernias.
 - and ⇒ In male : Epispadias is associated.
 - ⇒ In female : Cleft clitoris.

COMPLICATIONS

- ① Recurrent urinary tract infection
- ② Development of cancer bladder
- ③ Excoriation of the skin

INVESTIGATIONS

A Laboratory investigations

Urine analysis, blood urea & serum creatinine

B- Radiological investigations

Plain x-ray :

Shows **widening of symphysis**

TREATMENT

1. Complete reconstruction :

Now advisable

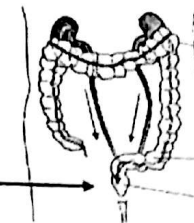
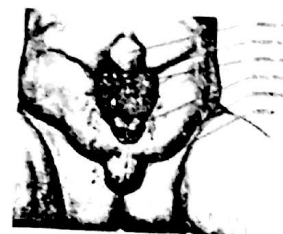
- **Extrophy** can now be diagnosed in -utero by characteristic U/S.

- **At birth** : The bladder mucosa should be covered by Non adherent film then convert extrophy to epispadias.

- **At 2nd year** : Penile & urethral reconstruction

2. Urinary diversion :

- **Excision** of the bladder followed with urinary diversion (uretero-sigmoid) but complicated with adeno-carcinoma of sigmoid



6- Hypospadias

DEFINITION

- The external meatus is situated at some point on **undersurface** of penis as in the perineum
- The missing part of the urethra is replaced by a fibrous band called **chordae**



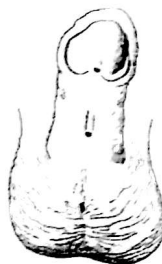
INCIDENCE

1 : 300 male children

CLASSIFICATION

According to site of external meatus →

- 1- **Glandular** : At glans penis
- 2- **Coronal** : At junction of glans penis & its body .
- 3- **Penile** : At undersurface of body.
- 4- **Peno-scrotal** : At junction on penis & perineum.
- 5- **Perineal** : The scrotum is split & the urethra opens between them



CLINICAL PICTURE

- 1- **Meatus** is ventrally placed & stenosed
- 2- **Prepuce** is deficient ventrally
- 3- **Shaft** is curved ventrally because of chordae

COMPLICATIONS

- 1- **Abnormal Stream** of urination.
- 2- **Psychological problems**.
- 3- **Sterility (mechanical)** due to failure of installation of semen in the vagina i.e. curved penis interferes with erection.

TREATMENT

- **Hypospadias** should not be circumcised because the skin of prepuce may be useful for further reconstruction.
- **Hypospadias** should be repaired before school age because of the psychological reason.
- **More recently** pediatric surgeons have begun repair at one year
 - 1st step : Straightening the penis by removal of chordae .
 - 2nd step : Skin of prepuce is used to develop a new urethra



Injuries of urinary tract

INJURIES OF URINARY TRACT

I- RENAL INJURIES

PREDISPOSING FACTORS

- A- Splenic enlargement which makes it more liable to trauma.
- B- Diseases of the spleen e.g. Hydronephrosis.

EXCITING CAUSE "Trauma" which may be

A- Closed trauma

- ① Direct trauma :
Blunt trauma e.g. car accident.
- ② Indirect trauma :
Fracture ribs.
- ③ Spontaneous rupture :
Rare with hydronephrosis.

B- Opened trauma

- ① Gunshot wounds.
- ② Punctured due to stabbing.
- ③ Operative trauma

PATHOLOGY

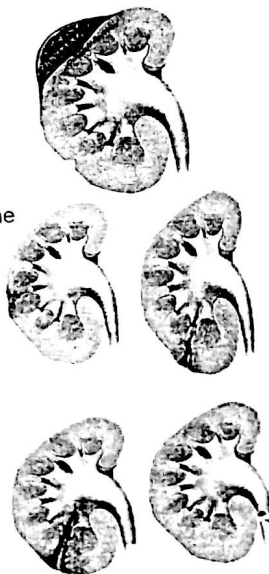
The kidney is containing a large amount of fluid e.g. urine blood, which transmits the force of trauma equally throughout tissues & surface of kidney.

Types of renal injury may be

- 1- Subcapsular hematoma.
- 2- Superficial tear or tears.
- 3- Deep tear or tears.
- 4- Avulsion of a pole of the spleen.
- 5- Injury of vascular pedicle

COMPLICATIONS

- ① Hemorrhage which may be internal or external.
- ② Renal cyst may follow a peri-nephric hematoma.
- ③ Associated other abdominal or thoracic injuries.
- ④ Hydronephrosis : Fibrosis of peri-renal tissues → ureteric obstruction.
- ⑤ Pseudo-hydronephrosis : due to accumulation of urine in peri-nephric space
- ⑥ Atrophy & fibrosis
- ⑦ AV fistula : may occur after penetrating injuries.
- ⑧ Nephroptosis : due to tearing of supporting tissues.



CLINICAL PICTURE

A- History of trauma

To loin followed by an abdominal pain ± shock.

B- Symptoms

- 1- Pain : localized to renal area
- 2- Hematuria : Microscopic or gross appearance.

N.B: Hematuria will be absent in

- ① The injury is only subcapsular.
- ② The ureter is blocked by clot
- ③ The ureter is injured.
- ④ The whole kidney is avulsed.
- ⑤ severe hypotension from internal hemorrhage.

3- Paralytic ileus due to irritation from retro- peritoneal bleeding.

4- Retention of urine due to blood clots in urinary bladder.

C- Signs

1- SIGNS OF SHOCK

i.e. Hypovolemic shock

- ① Tachycardia & tachypnea (air hunger)
- ② Hypotension & hypothermia.
- ③ Pale cold skin & oliguria.

2- TENDERNESS & RIGIDITY on the affected side

3- MASS in flanks caused by extravasated blood & urine.

4- ABDOMINAL DISTENSION due to associated ileus.

INVESTIGATIONS

1- Laboratory investigations

Urine analysis, blood urea & serum creatinine

2- Radiological investigations

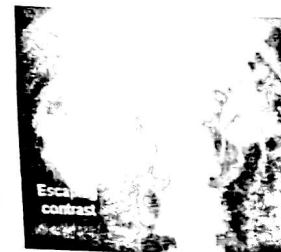
1. U/S & CT scan (diagnostic)

2. I.V.P shows

- ① Normal function & configuration if minimal injury
- ② No visualization if total pedicle avulsion
- ③ Deformed renal pelvis & calyces .
- ④ Displaced renal pelvis, calyces & ureters .
- ⑤ Extravasation of dye in peri-nephric space.
- ⑥ Confirm the presence of opposite functioning kidney

3. Renal isotopic scanning

useful in patients allergic to the contrast material.



4. Plain x-ray : shows

- ① Obliteration of psoas muscle shadow.
- ② Obliteration of renal outlines.
- ③ Fracture one or more of lower ribs.
- ④ ± Evidence of cause e.g. bullet.
- ⑤ Distended Intestinal loops from Associated Ileus.

TREATMENT

A- Anti-shock measures

- Remember ABCDE
- Blood transfusion, warmth, morphiaetc.
- Antibiotics to prevent pen-nephric abscess formation .
- Analgesics for pain

Then

- Bed rest until hematuria has stopped.
- Large amount of fluid intake to guard against clot retention.
- Follow up charts for
 - ① Pulse, ABP & size of peri-renal mass .
 - ② Urine analysis for RBCs & pus.
 - ③ HB %, haematocrite. U/S & I.V.P

B- Surgical treatment

INDICATIONS

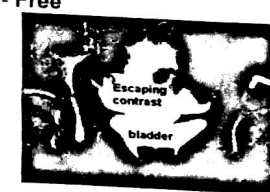
- 1- Persistent hematuria under conservative tretment
- 2- Progressively enlarged pen-nephric mass.
- 3- Peri-renal infection.
- 4- Failure to control shock .
- 5- Open injuries
- 6- Associated intra-peritoneal injuries .

APPROACH Trans-peritoneal approach.

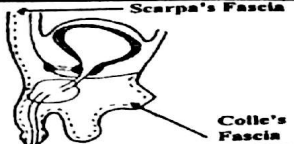
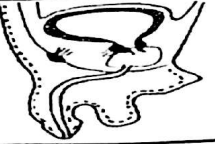
PRINCIPLES

- 1" control vascular pedicle by vascular clamp to bleeding.
- Then according
 - 1- Traumatic renal tissue → Debridement
 - 2- Hematoma → Evacuation
 - 3- Small tears → Suture.
 - 4- Large defect → Filled with per-nephric fat.
 - 5- Avulsed one pole → Partial nephrectomy
 - 6- Avulsed kidney → Total nephrectomy provided that other kidney is functioning

II- TRAUMATIC RUPTURE OF URINARY BLADDER

INTRAPERITONEAL (20%)	EXTRAPERITONEAL (80%)
	
BLOW to lower abdomen with fully distended bladder	FRACTURE PELVIS 2ry to run over accident
causes of both types • Gunshot wound • Stab wound • Instrumentation	
PATHOLOGY - The urine escapes into the peritoneal cavity & may lead to peritonitis	PATHOLOGY - The urine extravasates in pelvis then it ascends up between peritoneum & the fascia transversalis.
CLINICAL PICTURE	CLINICAL PICTURE
Symptoms - Supra-pubic pain - No desire of micturation. - Symptoms of peritonitis	Symptoms - Supra-pubic pain - Desire of micturation. but no passage of urine - Symptoms of # pelvis
Signs - Supra-pubic tenderness & rigidity. - Bladder cannot be felt. - Signs of peritonitis	Signs - Supra-pubic tenderness & rigidity. - Bladder can be felt. - Signs of # pelvis
INVESTIGATIONS	INVESTIGATIONS
1- X-ray	1- X-ray
	
2- Cystography	2- Cystography
- Free - Leak of dye from bladder	- Fracture pelvis - Leak of dye from bladder
TREATMENT	
Anti-shock measures + Urgent exploration	
- Abdomen is opened & urine in peritoneum is sucked. - Tear in the bladder is closed. - The bladder is drained by cystostomy tube. - peritoneum is drained	- Supra-pubic extra-peritoneal exploration - Tear in bladder is closed - The bladder is drained by cystostomy tube. • # pelvis is treated

III- TRAUMATIC RUPTURE OF URETHRA

	EXTRA-PELVIC ANT. URETHRA	INTRA-PELVIS POST. URETHRA
		
CAUSES	DIRECT TRAUMA to the perineum (kick or falling astride an object) or instrumentation	FRACTURE PELVIS which tears the pubo-prostatic ligament & prostate displaced upward
PATHOLOGY		
Site	- Bulbous (penile) urethra i.e. Ant. urethra.	- Membranous urethra i.e. Post. urethra.
Extravasation of urine	- The urine escapes into the scrotum, penis & then rises up to abdominal wall under superficial fascia in front of muscles .	- The urine escapes into the pelvis then it ascends up between peritoneum & the fascia transversalis.
CLINICAL PICTURE	• The common presentations are → ① Urethral bleeding. ② Inability to pass urine ③ Bladder is distended ④ Pain in the perineum.	
INVESTIGATIONS	⑤ Perineal hematoma	⑤ Picture of # pelvis
1- X-ray	- Free	- Fracture pelvis
2- P/R	- - ve	- Prostate cannot be felt as it is displaced upwards.

TREATMENT

The patient is instructed NOT to void urine

- Catheter is contraindicated as it can compound the damage & introduce infection.
- Urgent ascending urethrogram is done to obtain correct diagnosis
- Urgent supra-pubic cystostomy tube is done.
- Treatment of # pelvis with intra-pelvic type only.
- After 3 weeks :

Micturition cystography is done

If urethra is healed the supra-pubic tube is removed.
But if stricture develops endoscopic regular dilatation or reconstruction after excision of stricture.

Inflammations of urinary tract

INFLAMMATIONS OF URINARY TRACT

I. Pyonephrosis

DEFINITION (Chronic) + pus

Chronic retention of infected urine in the kidney

AETIOLOGY

• **1st Pyonephrosis** : Due to coincident infection and obstruction such as stone, stricture.

• **2nd Pyonephrosis** : Due to infection of pre-existing hydronephrosis.

PATHOLOGY

• **The renal parenchyma** : is formed multi-locular cavities with pus and lined by necrotic tissues

• There are **marked peri-nephritis** with chronic adhesion

• **According to aetiology** →

⇒ **1st PYONEPHROSIS** : (Thick wall cavities)
The kidney is not markedly enlarged from associated infection and fibrosis with obstruction

⇒ **2nd PYONEPHROSIS** : (Thin wall cavities)
The kidney is markedly enlarged.

CLINICAL PICTURE

The cardinal symptoms (Pain, swelling, fever & pyuria)

1- **Pain** in the loin & aching in character. *worse at night*

2- **Swelling** which is small if 1st type or large if 2nd type.

3- **Fever** ranging from low fever 38 °C up to high fever.

4- **Pyuria** may absent with pelvi-ureteric junction obstruction.

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for **pus** cells.
- ② Blood urea & serum creatinine .
- ③ Blood picture for **leucocytosis** .

2. Radiological investigations

1- **U/S & CT scan** (diagnostic)

2- **Plain x-ray** may show associated calculus .

1 1st Pyonephrosis



2 2nd Pyonephrosis



3- **I.V.P** shows delayed or absent excretion of dye by diseased kidney.

N.B Ascending pyelography is required in many cases to .

- ① Confirm the diagnosis .
- ② Estimate the degree of dilatation of renal pelvis
- ③ Estimate the level of obstruction.

3. Instrumental (cystoscopy)

It shows chronic cystitis or pus from ureteric orifice

TREATMENT

Infection of an obstructed kidney should be treated as an emergency

1- **ANTIBIOTICS** are prescribed and the kidney is drained by inserting a **PERCUTANEOUS NEPHROSTOMY TUBE** then any cause of obstruction as stone or stricture should be controlled.

2- **NEPHRECTOMY** : if advanced cases, provided other kidney is functioning

3- **PERMANENT NEPHROSTOMY** : if the opposite kidney is non functioning

II- Perinephric abscess

DEFINITION

It is a localized suppurative inflammation of peri-nephric space

AETIOLOGY

• **1st perinephric abscess (rare)** blood-borne

i.e. from distant septic focus e.g. Renal carbuncle.

• **2nd perinephric abscess (common)** direct spread

from kidney or surrounding structure e.g. peri-renal hematoma

CLINICAL PICTURE

Symptoms

- **General** : Hectic Fever, Headache, Malaise & Anorexia
- **Local** : Acute onset of **throbbing** pain in loin

Signs Tender renal angle.

INVESTIGATIONS

1. Laboratory investigations

Same as pyonephrosis.

2. Radiological investigations

1- **U/S & CT scan** (diagnostic).

2- **Plain x-ray** shows obliteration of psoas muscle shadow & elevated (fixed) diaphragm

TREATMENT

Urgent drainage (U/S guided)
under cover of antibiotics.

III. Pyelonephritis

1- Acute pyelonephritis

AETIOLOGY

A- Routes of infection

- ① Ascending infection from lower urinary tract.
- ② Hematogenous (uncommon) e.g. in infective endocarditis
- ③ Lymphatic route

B- Predisposing factors

- ① Stagnation of urine due to obstruction at any level of urinary tract.
- ② Vesico-ureteric reflux.
- ③ Introduction of infection through catheterization

CLINICAL PICTURE

Symptoms

- **General** : Fever, Headache, Malaise & Anorexia
- **Local** : Acute onset of pain in loin with ↑↑ frequency & dysuria.

Signs Tender renal angle.

INVESTIGATIONS

1. Laboratory investigations
Same as pyonephrosis.
2. Radiological investigations
Investigations to detect the cause.

TREATMENT

- 1- **Rest, antibiotics** according to culture & sensitivity test.
- 2- **Excessive** intake of fluid & **change the P.H** of urine
- 3- **Correction of predisposing factors.**

2- Chronic pyelonephritis

It is due to improper treatment of acute pyelonephritis

PATHOLOGY

Early damage of renal tubules then late damage of glomeruli

CLINICAL PICTURE as acute pyelonephritis but

- Recurrent attacks of loin pain,
- Hypertension, hematuria & anemia.

INVESTIGATIONS as acute pyelonephritis

TREATMENT

- Proper, regular course of **antibiotics**
- **Renal transplantation** if renal failure occurs.

IV. Renal tuberculosis

INCIDENCE

- Always 2nd T.B.
- **Age** : Rare in children & usually in young age.
- **Sex** : Male > female

AETIOLOGY

- Causative organisms are T.B.
 - Human type 75 %
 - Bovine type 25 %

PATHOLOGY

The disease is usually **unilateral** in early stages but later on may attack the **opposite** kidney.

- The kidneys : Shows

- ① T.B follicles affect renal pyramids then unite together to burst into the pelvi-calyceal system
→ **Ultero-cavernous type**
or unite & caseate to renal parenchyma
→ **Caseo-cavernous type**

- ② Obstruction of pelvis & ureter → Hydronephrosis

- ③ T.B affection of perinephric fat → Perinephric T.B

N.B: Sometimes the kidney is shut off & atrophied
So autonephrectomy is developed

- The ureters :

- Thickened, fibrosed & shortened.
- In long standing cases :
gaping & retraction of ureteric orifice occur (**Golf hole ureter**)

- The urinary bladder :

- Thickened, fibrosed & contracted.
So. the capacity is progressively diminished (**Thimble bladder**)

- The genital organs :

- Seminal vesicles, prostate, epididymis & vas may be affected

CLINICAL PICTURE

Symptoms

- **General** : Night fever, night sweat, loss of weight & loss of appetite.

- **LOCAL** : ① **Frequency** is the earliest & main symptoms.
due to ① irritation by T.B debris .
② contracted bladder.
③ T.B cystitis.

- ② **Pain** : Dull aching in Loin.

- ③ **Pyuria** : Pus cells with out organism (sterile pyuria) + hematuria.

Signs It is unusual for T.B kidney to be palpable & P/R for genital lesions.

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for pus cells.
- ② Blood urea & serum creatinine .
- ③ Tuberculin Test
- ④ Bacteriological studies
 - as A. Ziehl-Nelson's stain 72 % of cases.
 - B. Culture on Lowenstein media 98 % of cases
 - C. Guinea pig inoculation 94 % of cases.

2. Radiological investigations

- 1- **Plain x-ray** : show calcification in the kidney or 2ry to stone.
- 2- **I.V.P** : shows (**Moth-eaten appearance**)
if the calyx is affected & loses its clear outlines.
- 3- **U/S & CT scan** (diagnostic).

3 . Instrumental (cystoscopy)

It shows ureteric & bladder pathology.

TREATMENT

A. Medical Anti-T.B drugs for 1 year.

B. Surgical If complicated →

1- Renal cavernotomy :

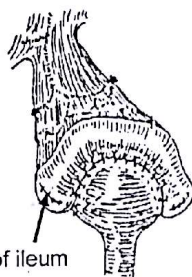
for single close pyocalyx by removing the roof of abscess & caseous material is removed till the healthy granulation tissue is reached.

2- Ileo-cystoplasty :

for augmentation of contracted bladder by loop of ileum

3- Nephro-ureterectomy

provided that opposite kidney is healthy.



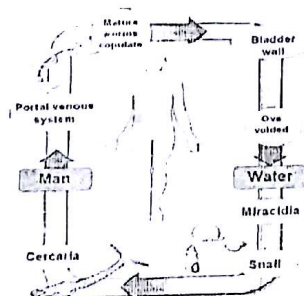
V. Bilharziasis of the urinary bladder

INCIDENCE

- Age : 10-30 years
- Sex : Male > female
- Mainly due to Schistosoma hematobium

AETIOLOGY

The worms migrate from liver to inferior mesenteric vein & reach the bladder through the anastomosis between superior rectal vein & the vesico- prostatic plexus of veins.



PATHOLOGY

A- Site Sub mucosa of urinary bladder.

B- Gross picture

- 1- **Redness of mucosa** i.e Patchy hyperemia
It is due to extrusion of ova through the mucosa. so leads to terminal hematuria.
- 2- **Bilharzial granuloma of sub mucosa :**
It is due to retained ova in wall of the bladder.
- 3- **Bilharzial nodules (polyps) :**
It is due to localized hyperplastic epithelium.
- 4- **Bilharzial papilloma :**
It is a polypoid projection of mucous membrane
- 5- **Bilharzial ulcer :**
It is due to atrophy of the mucosa overlying bilharzial ova.
- 6- **Bilharzial sandy patches :**
It means aggregation of calcified dead ova in the submucosa. It can be seen because of atrophic over-lying mucosa.



C- Microscopic picture

- 1- **Hyperplasia** of the mucosa.
- 2- **Brunn's nests** : It is buds of hyperplastic epithelium
- 3- **Cystitis cystica** results from degeneration of Brunn's nests.
- 4- **Cystitis glandularis** : The Brunn's nest undergo metaplasia into columnar epithelium.
- 5- **Squamous metaplasia** which is precancerous



COMPLICATIONS

- Stricture lower 1/3 ureter
- Bladder neck obstruction (B.N.O)
- 2nd bacterial infection
- 2nd changes of the kidney e.g. hydronephrosis
- Stone formation
- Cancer bladder (Squamous cell carcinoma)
- Contracted bladder
- Pericystitis leading to formation of a dense fibrous sheath

CLINICAL PICTURE

1- TERMINAL HEMATURIA

It is caused by extrusion of the ova at end of micturation

2- DIFFICULTY IN MICTURATION

At 1st slight but in late cases severe difficulty because of B.N.O & stone formation .

3. FREQUENCY

From congestion of trigon or 2nd to cystitis.

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for pus cells, RBC s & ova
- ② Blood urea & serum creatinine

2. Radiological investigations

PLAIN X-RAY

for bilharzial calcifications.

3. Instrumental (cystoscopy)

To diagnose the extent of the disease & to take a biopsy.

TREATMENT

A. Medical treatment Anti- bilharzial drugs + urinary antiseptics.

B. Surgical treatment

According to th

- 1- BILHARZIAL POLYPS : Cystoscopic removal
- 2- BILHARZIAL PAPILLOMA : Partial cystectomy.
- 3- BILHARZIAL ULCER : Surgical excision.
- 4- BILHARZIAL SANDY PATCHES : Cystoscopic diathermy coagulation

C. Treatment of complications

According to th

- 1- B.N.O : Wedge excision to relieve urine outflow obstruction .
- 2- CONTRACTED BLADDER : Ileo- cystoplasty.
- 3- STRICTURE LOWER 1/3 URETER :
 - ① Urteroscopic balloon dilatation
 - or ② Uretro-vesical re-implantation after excision of stenosed segment.

4- CALCIFICATION : Cystoscopic curettage & litholopaxy

5- CANCER BLADDER : (See later)

Urinary calculi

URINARY CALCULI

INTRODUCTION

INCIDENCE

- It is a common disorder affecting 10 - 20 % of population
- Age : mainly middle age persons but no age is excluded.
- Sex : Male > female

AETIOLOGY

- 1- Geography** There is ↑ incidence in desert
- 2- Climate & seasonal factors** There is a relationship between higher environment temperature & ↑ incidence of urinary stone
- 3- Water intake** Both volume & content of water ingested are important in the aetiology of stone disease .
- 4- Diet** Some food stuffs are rich in certain crystals
e.g. 1- Spinach, tomatoes & mango rich in oxalates
2- Liver, kidney, sardines, salmon & duck rich in Uric acid
3- Milk & its products are rich in calcium .

5- Metabolic & endocrine factors

These vary according to type of stone

(A) Ca. oxalate & Ca. phosphate calculi :

1- HYPERCALCAEMIA & HYPERCALCAIURIA :

- due to ① hyperparathyroidism.
② Renal tubular acidosis.

2- HYPEROXALURIA :

- may be ① **Congenital** : It is a rare congenital illness.
② **Acquired** : It is seen with enteric diseases.
③ **Idiopathic** : It is due to eating food rich in oxalates in large amounts.

(B) Uric acid calculi :

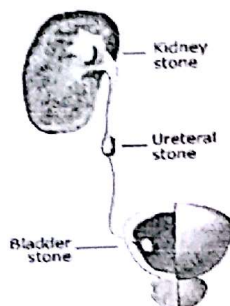
- 1- Hyperuricemia e.g. gout.
- 2- Hyperuricosuria.

(C) Cystine calculi :

Due to hereditary cystinuria

(D) Xanthine calculi :

Due to hereditary xanthinuria .



6- Congenital anomalies

Predispose to stasis → infection & stone formation

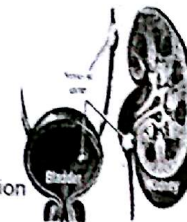
7- Urinary tract obstruction

Predispose to stasis → infection & stone formation

8- Infection

Infection provides a **nucleus** for future stone formation i.e pus cells & infection changes the PH of urine

N.B. : Phosphates are precipitated in **alkaline** urine but Oxalates, uric acid & cystine are precipitated in **acidic** urine



PATHOLOGY (Types of urinary stones)

	OXALATE	PHOSPHATE	URIC ACID
INCIDENCE	75 %	15 %	7 - 9 %
P.H	Acidic	Alkaline	Acidic
CHEMISTRY	Ca oxalate	Ca phosphate alone or with ammonium phosphate & magnesium phosphate i.e triple phosphate	Uric acid
NUMBER	Single	Single or multiple	Multiple
SIZE	Moderate	Large It may fill the renal pelvis & the calyces taking their shape i.e Staghorn stone	Small
SURFACE	Irregular & spiky	Smooth	Smooth
COLOUR	Although white it is usually brown to black due to incorporation of blood pigments	Yellowish white	Golden yellow
CONSISTENCY	Very hard	Chalky & friable	Hard
X-RAY	Radio-opaque	Radio-opaque	Pure uric acid stones are radiolucent

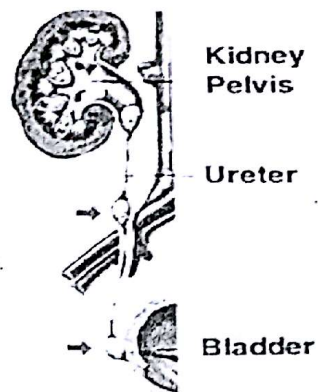
CLINICAL PICTURE

SILENT with renal & bladder stones.
i.e. accidentally discovered.

PAIN caused by movement of stones.
i.e. describe as (page 4)

COMPLICATIONS

- ① Obstruction.
- ② Back pressure changes
e.g. hydronephrosis.
- ③ Calcular anuria
- ④ Hematuria.
- ⑤ Migration
- ⑥ Infection.
- ⑦ Malignancy (renal pelvis & bladder)
from chronic irritation..



INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for pus cells, RBC s & crystals
- ② Blood urea & serum creatinine .

2. Radiological investigations

1- PLAIN X-RAY

90 % of urinary stones are radio-opaque because

Renal stones



Ureteric stones



Bladder stones



Urethral stones



OXALATE

PHOSPHATE

POSTERIOR

ANTERIOR

2- I.V.P & ascending pyelography

Show obstruction by stone, give idea about opposite kidney.
& Radiolucent stones which appear as filling defects
e.g. pure uric acid stones .

3- U/S & CT scan (diagnostic).

To visualize The kidney & the degree of obstruction.

I- RENAL STONES

AETIOLOGY As before

PATHOLOGY

• **Types of stones** : As before.

• **Site & shape** :

- ① Pelvis : Triangular .
- ② Calyces : Rounded or oval .
- ③ Pelvi-calyceal : Staghorn .

CLINICAL PICTURE As before.

INVESTIGATIONS As before but ➔

• **Radio-opaque shadow may be mistaken for :**
1- Rt. side with stone of gall bladder

N.B : In case of single stone

Lat. view must be done to differentiate :

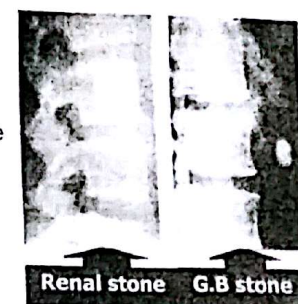
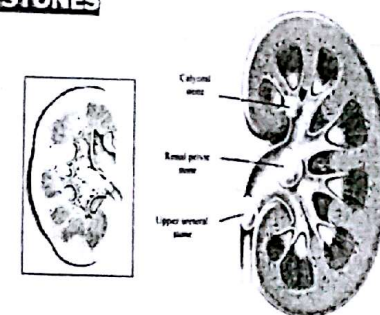
- The gall stone which present in front of spine
- Rt. renal stone which present upon spine

2- Calcified renal T.B focus.

3- Calcified L.Ns in porta hepatis.

4- Calcified costal cartilage .

5- Calcified supra-renal gland .



URETERIC STONES

AETIOLOGY As before

PATHOLOGY

• **Types of stones** : As before.

• **Site** : It is the site of normal narrowing

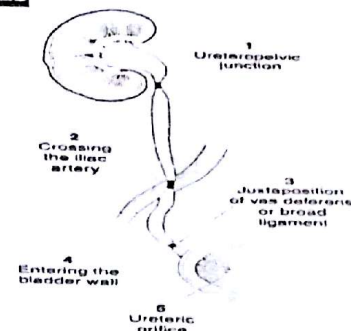
- ① Pelvi-ureteric junction
- ② Crossing of the iliac artery
- ③ Intramural part " bladder wall "
- ④ At ureteric orifice

CLINICAL PICTURE As before.

INVESTIGATIONS As before but ➔

• **Plain X-ray** shows shadow along the course
of the ureter which is ➔

- 1- Transverse process of lumbar vertebra.
- 2- Near sacro-iliac joints.
- 3- Vertically to the level of ischial spine.
- 4- Turns medially towards the bladder .



URINARY BLADDER STONES

AETIOLOGY As before

PATHOLOGY

• **Types of stones :** As before.

CLINICAL PICTURE As before +

1- Frequency :

More by day from trigonal irritation by the stone, later on day & night from developed cystitis.

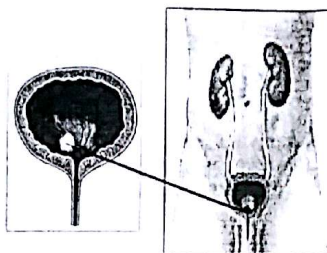
2- Terminal hematuria :

Due to bladder contraction over the stone at bladder neck.

3- Interruption of urinary stream :

If a stone is blocking the internal meatus.

INVESTIGATIONS As before



URETHRAL STONES

AETIOLOGY As before

PATHOLOGY

• **Types of stones :** As before.

CLINICAL PICTURE As before +

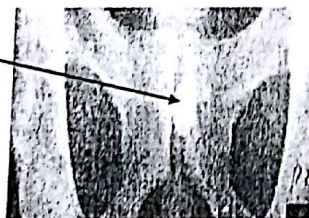
1- Ureteric colic few days ago.

2- Interruption of stream followed by retention of urine.

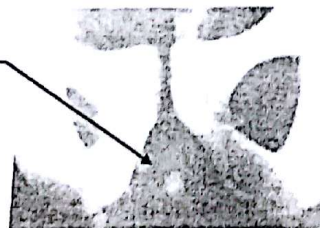
INVESTIGATIONS As before but +

• **Plain X-ray** shows

1- Stone posterior urethra
i.e. behind symphysis pubis



2- Stone anterior urethra
i.e. below symphysis pubis.



TREATMENT

Treatment of urinary calculi

(A) Management during attacks of pain

- 1- Hospitalization may be necessary.
- 2- I.V analgesics (opiates) may be required.
- 3- Antispasmodic & anti-inflammatory like indomethacin.
- 4- Maintain divorces by administration of I.V. fluid & diuretics.
- 5- Antibiotics if there is suspicion of urinary tract infection.

(B) Management of urinary calculi

1- Treatment of renal stones

A- Medical (conservative) treatment

- Indications :

- ① Stone < 5 mm in diameter
- ② No evidence of back pressure effect.
- ③ No associated infection.

- Methods :

- ① The main item is high fluid intake.
- ② Intermittent course of diuretic & urinary antiseptics.
- ③ Alkalinization or acidification of urine according to the P.H

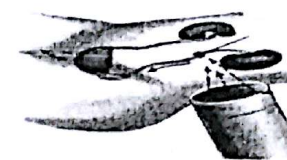
B- Instrumental treatment

- Indications :

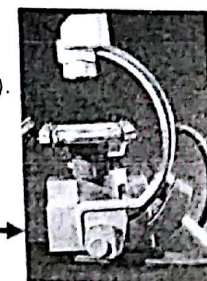
- ① Stone > 5 mm or growing stone.
- ② Evidence of back pressure or infection.
- ③ Persistent pain or gross hematuria.

- Methods :

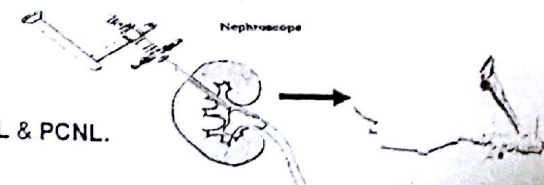
- ① Extra-corporeal shock wave lithotripsy (ESWL).



- ② Percutaneous nephrolithotomy (PCNL).

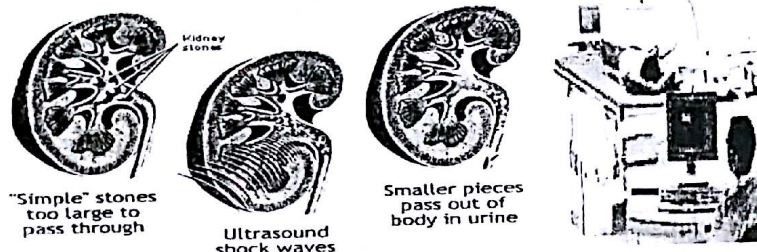


- ③ Combined ESWL & PCNL.



1- Extra-corporeal shock wave lithotripsy (ESWL)

INDICATIONS In addition to above
stone < 2 cm whether calyceal or pelvic



CONTRAINDICATIONS

- ① Acute renal infection .
- ② Renal insufficiency .
- ③ Distal obstruction .
- ④ Stones of lower calyx .
- ⑤ Pregnancy & bleeding tendency .
- ⑥ Spine abnormalities as Kyphosis or marked scoliosis
(location of stone is very difficult)

COMPLICATIONS " Very minimal "

- ① Transient attacks of hematuria .
- ② Colicky ureteric pain .
- ③ Failure to disintegrate the stone .
- ④ Fever due to acute obstruction .

2- Percutaneous nephrolithotomy (PCNL)

INDICATIONS Nowadays is used when .

- ① ESWL is failed.
- ② ESWL is contraindicated .
- ③ If stone > 2 cm it is indicated in combination with ESWL.

ADVANTAGES

- ① Small endoscopic wound.
- ② Mild post-operative pain .
- ③ Short hospital stay .

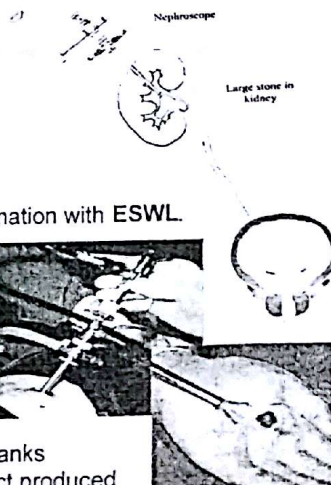
THE PROCEDURE

1- Access to renal pelvis :

By placing a guide wire through the flanks under sonographic guide then the tract produced by the wire is dilated to admit the nephroscope

2- Stone removal :

Direct removal through the nephroscope if small by stone forceps.
but if large stone will need a prior disintegration by ultrasonic laser then removal through nephroscope.



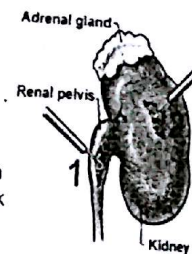
C- Surgical treatment (open surgery)

- Indications :

Only for those patients whom are contraindicated to ESWL or failed with PCNL.

- The possibilities :

- 1- Pyelolithotomy for stone in renal pelvis .
- 2- Nephrolithotomy for stone in renal parenchyma .
- 3- Pyelonpheralithotomy : combined approach .
- 4- Lower partial nephrectomy : If stone impacted in lower calyx with narrowing of its neck
- 5- Nephrectomy : If non-functioning kidney provided that other kidney is functioning



2. Treatment of ureteric stones

A- Medical (conservative) treatment

- Indications :

- ① Stone < 5 mm in diameter
- ② No evidence of back pressure effect.
- ③ No associated Infection.

- Methods :

- ① The main items is high fluid intake.
- ② Intermittent course of diuretic & urinary antiseptics.
- ③ Alkalinization or acidification of urine according to the P.H

B- Instrumental & surgical treatment

- Indications :

- ① Stone > 5 mm or growing stone.
- ② Evidence of back pressure or infection.
- ③ Persistent pain or gross hematuria.

- Methods :

Procedures for removal differ according to site of stone & its size

⇒ UPPER 1/3 URETER

- Stone < 1 cm, it is pushed up to the kidney by a ureteric catheter & the ESWL is used.

- Stone > 1 cm, uretero-lithotomy (lumber incision)

⇒ UPPER 1/3 URETER

- Uretero-lithotomy (Abernathy's incision)

⇒ UPPER 1/3 URETER

- Stone < 1 cm, can be extracted by ureteroscopy (URS)

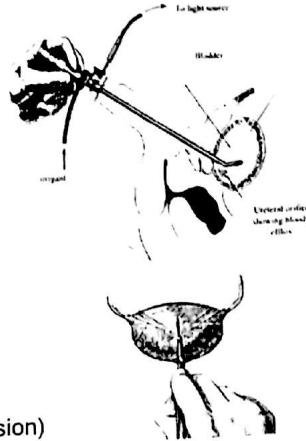
- Stone > 1 cm, uretero-lithotomy (suprapubic incision)

3. Treatment of urinary stones

According to the size of stone

A- Instrumental treatment (If stone ≤ 2 cm) .

Can be crushed mechanically by the lithotrite (litholopaxy) as can be disintegrated by ultrasonic waves or electrohydraulic shock waves. The fragments are then lavaged outside the bladder



B- Surgical treatment (If stone > 2 cm)

OTHER INDICATIONS as $\rightarrow$

- ① Multiple stones .
- ② Stone at a diverticulum .
- ③ Failure of crushing the stone .

METHOD (Cystolithotomy) (suprapubic incision)

4- Treatment of urethral stones

According to the site of stone

1- PROSTATIC URETHRA

A metal bougie is passed along the urethra to dislodge the stone in bladder then managed as urinary bladder stone.

2- MEMBRANOUS URETHRA

Removed by a urethral forceps passed through a urethroscope

(C) Metabolic work up to prevent stone recurrence

1- The stone should be chemically analyzed.

2- The following investigation should be performed $\rightarrow$

- a. Serum calcium & phosphorus to exclude hyperparathyroidism.
- b. 24 hours urine collection for normal level :
 - Oxalate < 40 mg
 - Calcium < 300 mg
 - Uric acid < 800 mg

3- Advices to given to patients with urinary calculi

- a. High fluid intake especially in hot weather.
- b. Certain precautions according to the type of the stone, to avoid cretin diets "see before".
- c. Treatment any metabolic disorder if possible e.g. Gout.

Obstructive uropathy

OBSTRUCTIVE UROPATHY

AETIOLOGY

According to the level of obstruction :

I. Pelvi-ureteric junction

- Idiopathic pelvi-ureteric junction obstruction (P.U.J.O)
- Stricture due to T.B .
- Stone .

II. Ureteral causes

- **IN THE LUMEN** : e.g. Calculi
- **INSIDE THE WALL** :
 - ① Congenital : e.g. Atresia .
 - ② Traumatic : e.g. Stricture following trauma .
 - ③ Inflammatory : e.g. Stricture following T.B
 - ④ Neoplastic : e.g. papilloma or carcinoma.
- **OUTSIDE THE WALL** :
 - ① Infiltration by cancer cervix , colon or rectum .
 - ② Idiopathic retroperitoneal fibrosis .
 - ③ Aberrant vessels.

III. Bladder causes

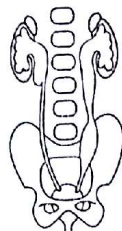
- Bladder neck obstruction (BNO)
- Neurogenic bladder.
- Tumor involving the bladder neck.

IV. Prostatic causes

- Benign prostatic hyperplasia .
- Carcinoma of the prostate .

V. Urethral causes

- Congenital : e.g. Meatal stenosis.
- Traumatic : e.g. Rupture urethra .
- Inflammatory : e.g. Post-gonococcal infection
- Neoplastic : e.g. Polyps & carcinoma .



1- HYDRONEPHROSIS

DEFINITION

This is a chronic aseptic distention of the renal pelvis & calyces due to partial or intermittent obstruction of the urinary tract.

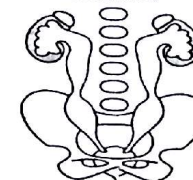
AETIOLOGY See causes of obstructive uropathy

Unilateral



- stone ureter
- ureteric stricture

Bilateral



- S.E.P or cancer prostate
- stricture urethra

PATHOLOGY There are 2 types ➤

Pelvic type



This occurs when the obstruction is **high** so the pelvis is **extra-renal**. The pelvis dilates & bulges forwards

Renal type



This occurs when the obstruction is **low** so the pelvis is **Intra-renal**. The calyces gradually dilate

IN ADVANCED CASES

The pelvis forms one large chamber with the kidney capped over a part of it.

IN ADVANCED CASES

The kidney becomes transformed into a lobulated sac with rounded bosses.

CLINICAL PICTURE In addition to picture of cause

1- Pain : Slight dull aching pain or discomfort in the loin .

2- Swelling : In late cases.

3- Urine : There is often polyuria of low specific gravity. i.e. Mal-functioning kidney .

Now

WE WILL STUDY

- 1- Hydronephrosis .
- 2- Benign prostatic hyperplasia (S.E.P)
- 3- Bladder diverticulum.
- 4- Urethral stricture.

COMPLICATIONS

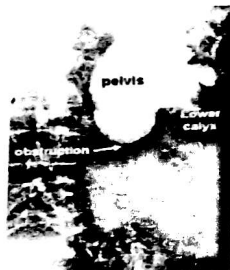
- 1- **Infection** i.e. pyonephrosis (2nd type)
- 2- **Rupture** of kidney.
- 3- **Stone** formation.
- 4- **Renal insufficiency** (failure) if bilateral.

INVESTIGATIONS

- 1- **Laboratory investigations**
Urine analysis, blood urea & serum creatinine
- 2- **Radiological investigations**

1. I.V.U shows

- ① Dilatation of renal pelvis.
- ② Clubbing or ballooning of the calyces.
- ③ Distortion of pelvi-ureteric junction.
- ④ Ureteric stricture.
- ⑤ Delayed or no excretion if advanced.



2 - Ascending pyelography :

If failed I.V.U

3- U/S & CT scan (diagnostic).

To visualize The kidney & the degree of obstruction.

3- Instrumental (cystoscopy & urethroscopy)

To exclude any abnormalities in bladder & urethra.

TREATMENT

1- 1st removal of the cause of obstruction .

2- In case of pelvi-ureteric junction obstruction

- Treatment :

By [Androsen - Hyne's] operation
This entails excision of proximal part of ureter & redundant pelvis .



3- Nephrectomy :

if the kidney is damaged provided that other kidney is functioning.

2- BENIGN PROSTATIC HYPERPLASIA (B.P.H)

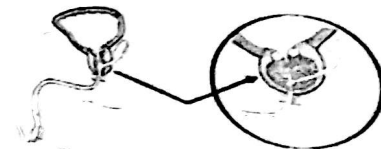
Senile enlargement of the prostate (S.E.P)

INCIDENCE

It affect 50 % of males > 50 years

AETIOLOGY

Unknown but may be hormonal imbalance stimulating the transition zone prostatic cells to undergo hyperplasia .



PATHOLOGY

Site The prostate is not divided into lobes.

Cut section The prostate is divided into zones .

- 1- **Anterior fibromuscular stroma.**
- 2- **Peripheral zone.**
- 3- **Central zone.**
- 4- **Transition zone (Peripheral zone)**

It is the transition zone which is the origin of the B.P.H., with development of nodules that enlarge & compress the urethra

Microscopic picture Hyperplasia

Five microscopic appearances are identified :

- 1- **Stromal.**
- 2- **Fibromuscular.**
- 3- **Muscular.**
- 4- **Fibroadenomatous.**
- 5- **Fibroadenomatous (most common)**



PATHO-PHYSIOLOGY

On developing B.P.H the nodules may differentiate into lateral & middle lobes that obstruct both urethra & bladder neck

A- The urethra

- Elongated, narrowed as it is compressed laterally .
- The normal post. Curve of the urethra is exaggerated

B- The urinary bladder

- Early muscle of the bladder undergo hypertrophy to overcome obstruction (i.e. S.E.P) causing trabeculation & diverticulum.
- Later on the bladder becomes dilated from chronic retention (residual urine) → Atony .

C- Ureter

- Early muscle of the ureter undergo hypertrophy.
- Later on the bladder becomes dilated from atony

C- kidney

- Hydronephrosis i.e. due to back pressure.



CLINICAL PICTURE

A- Symptoms of uncomplicated cases

1. Frequency :

- At 1st nocturnal from pelvic congestion, later on becomes both nocturnal & diurnal from complications.

- Causes of frequency:

- ① Elongation of posterior urethra & exposure of this sensitive mucosa to the urine.
- ② Stretch of the internal sphincter allow few drops of urine to escape in the posterior urethra leading to urgency
- ③ Presence of residual urine
- ④ Complications as cystitis, stone or diverticulum.

2. Difficulty :

- To start : The strain will lead to congestion of prostate → more obstruction so straining ↑↑ the obstruction and so the patient learns to be relax i.e. Hesitancy.
- To maintain : Because the stream is weak, interrupted & forked
- To terminate : Dribbling of urine from residual urine.

3. Sexual symptoms :

- At 1st there is ↑↑ libido, but later on impotence may occur.

B- Symptoms of complicated cases

- General :

- Chronic renal failure with neglected cases.

- Local :

- Acute retention of urine may be the 1st presentation from congestion of the bladder neck.
- Chronic retention of urine with over flow from ↑↑ residual urine
- Hematuria (rupture of prostatic veins), cystitis, stone ...etc.

C- Examination

- General examination :

- For evidence of uremia (if renal failure)

- Local examination :

- Abdomen : For renal mass if late hydronephrosis.
- Urinary bladder : For supra-pubic fullness from retention.
- P/R examination shows [Ⓡ]
 - Smooth surface.
 - Firm in consistency
 - Symmetrical enlargement.
 - Sulci between lobes are accentuated.
 - Sliding of rectal mucosa over the prostate.



INVESTIGATIONS

1- Laboratory investigations

- Urine analysis, blood urea & serum creatinine

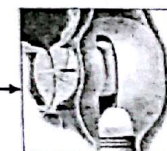
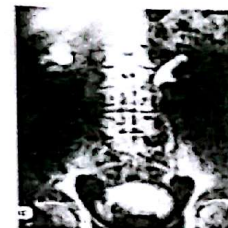
2- Radiological investigations

1. I.V.U shows [Ⓡ]

- ① Smooth basal filling defect in the bladder
- ② Any hydronephrotic changes of kidney.
- ③ Any bladder diverticulum.

2. Trans-rectal ultrasound (T.R.U.S)

- ① Detect non palpable malignancy in peripheral zone.
- ② Assess the size of enlargement.
- ③ U/S guided biopsy may be taken



3- Instrumental (cystoscopy & urethroscopy)

- To exclude bladder pathology especially vesical piles.

4- Flowmetry

- A maximum flow rate < 15 ml / sec indicate obstruction.

TREATMENT

A- Conservative treatment

- Since the natural history of B.P.H. is not uniform, patients with minimal symptoms & no complications may remain such for years.

- ⇒ These patients may be placed on [Ⓡ]

1- Watchful waiting :

- Close follow-up & advice to avoid wine & with holding micturation for long period

2- Medical treatment & watchful waiting :

- ① α -Blockers (Trasocine & prasocine) :

- They improve symptoms, particularly frequency

- ② 5- α -reductase inhibitors (Proscar) :

- It improves patients' symptoms & actually ↓↓ the size of the enlarged prostate. In patients who improve on **proscar**, the drug is to be continued for life.

B- Surgical treatment

INDICATIONS

- ① Distressing frequency.
- ② Difficulty in micturation.
- ③ Acute retention of urine.
- ④ Chronic retention of urine.
- ⑤ Hematuria, cystitis, diverticulumetc.

THE IDEA OF SURGERY

- To remove the adenomatous enlargement from inside the false capsule of compressed prostatic tissue.

METHODS OF SURGERY

- 1- Endoscopic surgery .
- 2- Open surgery

1- Endoscopic surgery

1. Trans-urethral resection (TUR)

- Using the **cysto-resectoscope**. The prostate is removed piece by piece using electric cutting.
- It is the operation of choice for the majority of patients.
- The only limitation is large adenoma because of hazardous result.

2. Visual laser ablation of prostate (V.L.A.P)

- Through a **cystoscope** a non-contact laser probe is used to evaporate the obstructing adenoma.
- It is a bloodless procedure with only a drawback of incomplete removal with possible recurrence.

3. Trans-urethral vaporization :

- Using high energy electric heating.

2- Open surgery

1. Trans-vesical prostatectomy

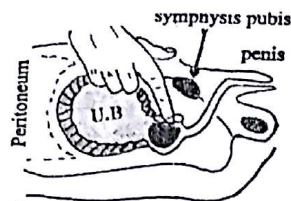
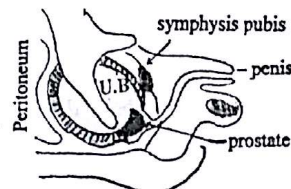
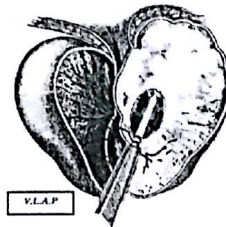
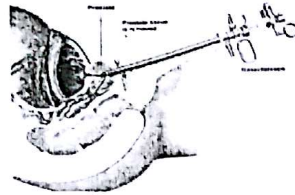
- Through a **midline supra-pubic incision**. The urinary bladder is opened, the index finger is inserted into the bladder neck, and so the adenoma is enucleated

2. Retro-pubic (Millin's) prostatectomy

- Through a **midline supra-pubic incision**. The retro-pubic space is exposed (by cutting) the pubo-prostatic ligaments. but the bladder is not opened, the adenoma is enucleated

Complications of open surgery

- ① **Bleeding** + clot retention .
- ② **Incontinence** : in 1 : 10,000 because of damaged internal sphincter.
- ③ **Retrograde ejaculation** because of damaged internal sphincter.
- ④ **Impotence** : (2 - 5 %) due to injury of pudendal nerve fibers in the region of posterior urethra.
- ⑤ **Urethral stricture** .
- ⑥ **Infection** : leading to urethritis & cystitis .
- ⑦ **TUR syndrome** :
This is dilutional hyponatremia that results from over absorption of irrigating fluid during **Trans-urethral resection (TUR)** to clear the field from blood. so uses of glycine for irrigation diminish this possibility.



3- URINARY BLADDER DIVERTICULAE

DEFINITION

It is a flask shaped protrusion through the muscle wall of urinary bladder.

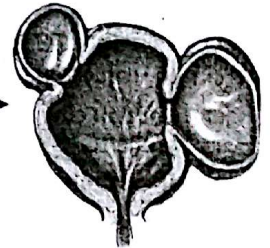
AETIOLOGY & TYPES

A- Congenital diverticulum (Rare)

- It is **solitary** & located medial to & above the ureteric orifice
- It has **muscle fibers** within its wall i.e formed of all layers of bladder.
- It is **contracted** during micturition.

B- Acquired diverticulum (Common)

- They are often **multiple** & always associated with distal obstruction & trabeculation of the wall of bladder.
- They have **no muscle fibers** within their wall
- They are **not empty** during micturition.



CLINICAL PICTURE

- There are **no specific symptoms** but acquired diverticulae may be filled with urine & subsequently empty into the bladder producing an immediate desire to pass urine as a second time after the end of micturition so it is called (**double micturition**) .

COMPLICATIONS

Stagnation of urine in the diverticulum may result in :-

- ① Infection.
- ② stone formation.
- ③ Squamous metaplasia.
- ④ Rarely, squamous cell carcinoma.

INVESTIGATIONS

1- Laboratory investigations

- Urine analysis, blood urea & serum creatinine

2- Radiological investigation

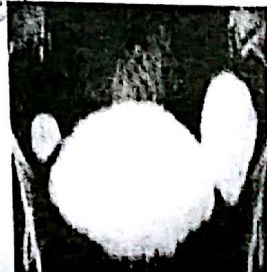
- **Cystography** (Ascending or descending)
Shows the diverticulae

3- Instrumental (cystoscopy)

- To demonstrates diverticular opening in the bladder.

TREATMENT

Excision if complicated or producing ureteric obstruction.



4- URETHRAL STRICTURE

CAUSES

- ① **Congenital** : e.g. Meatal stenosis.
- ② **Traumatic** : e.g. Rupture urethra.
- ③ **Inflammatory** : e.g. Sexual transmitted disease e.g. gonorrhea.
- ④ **Neoplastic** : e.g. Polyps & rarely carcinoma.

CLINICAL PICTURE

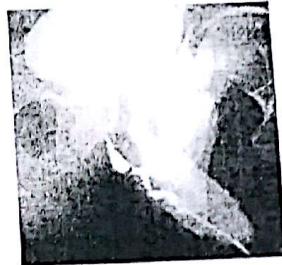
- ① **Difficulty** in micturation.
- ② **Frequency** due to incomplete evacuation of the bladder.
- ③ **Retention** of urine (acute & chronic)

COMPLICATION

- ① Peri-urethral fistulae & abscesses.
- ② Infertility .
- ③ Prostatitis .

INVESTIGATIONS

- 1- Laboratory investigations**
 - Urine analysis, blood urea & serum creatinine
- 2- Radiological investigation**
 - **Urethrography**
Shows the site, length & shape of stricture.
- 3- Instrumental (urethroscopy)**
Shows the site & extent of stricture.
- 4- Uroflometry** Reveals obstructed flow of urine through the urethra.



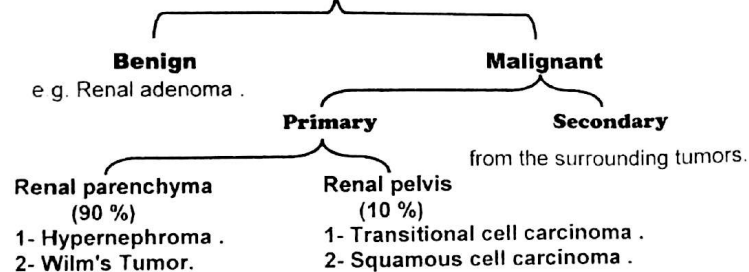
TREATMENT

- 1- Urethral dilatation** : regular & over multiple sittings .
- 2- Endoscopic visual internal urethrotomy** :
Through a **urethroscope**, the stricture is incised with a sharp knife blade usually at **12 o'clock position** then left to heal .
- 3- Urethroplasty** :
The idea is to excise the fibrous tissue of the stricture then constructing the urethra using skin flaps from penis, scrotum or perineum over a catheter

Tumors of the urinary tract

TUMORS OF THE URINARY TRACT

I- TUMORS OF THE KIDNEY



A- TUMORS OF RENAL PARENCHYMA

1- Renal cell carcinoma

Hypernephroma

INCIDENCE

- The **commonest** renal parenchymal tumor
- **Age** : 50 - 70 years.
- **Sex** : Male : female 2 : 1

AETIOLOGY (Predisposing factors)

- ① Using tobacco products i.e. smoking.
- ② Loss of the short arm of chromosome 3 is a constant chromosomal change in their patients
- ③ Renal adenoma.

PATHOLOGY

Site Commonest at upper pole (bilateral 1-2 %)

N/E picture

- **Shape** : Rounded or lobulated mass which compresses the kidney tissue giving a false impression of capsulation.
- **Size** : Ranges from few cm to a huge size.
- **Cut section** shows **golden yellow** color due to high lipid content of the cells with areas of hemorrhage & necrosis.

Microscopic picture

Adenocarcinoma of cells of proximal convoluted tubules (P.C.T)



- There are 2 types :

- ① **Clear cell type** as cholesterol crystals are dissolved during preparation by alcohol.
- ② **Granular cell type** due to increased mitochondria in the cytoplasm of the cells.

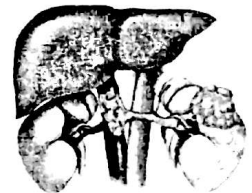
SPREAD

Direct spread To renal pelvis, Zukercandle's fascia.....etc.

Lymphatic spread To hilar L. Ns to para-aortic to cysterna chyli to thoracic duct & finally Lt. supra clavicular L. Ns i.e. Virchow's gland .

Blood spread

- **Embolization** : To lung (**cannon ball**), boneetc.
- **Permeation** : Growing to the lumen of renal vein to I.V.C & testicular veins



STAGING ROBSON STAGING SYSTEM

- **Stage I** : Tumor confined to the kidney.
- **Stage II** : Tumor invades Zukercandle's fascia & peri- nephric fat.
- **Stage III** : Tumor involves the renal vein + regional L. Ns.
- **Stage IV** : Distant metastasis.

CLINICAL PICTURE

Age 50 - 70 years.

Presentation

A- Typical presentation :

- 1- **Hematuria** : Total, painless, profuse, recurrent **50 %** of cases
 - 2- **Pain** : In **40 %** of cases. It may be due to
 - Stretch of renal capsule.
 - Passage of blood clot causing ureteric colic.
 - Infiltration of adjacent lumbar nerves.
 - 3- **Renal mass** : In **30 %** of cases irregular, hard renal swelling.
- N. B:** Metastasis may be the 1st presentation

B- Atypical presentation :

- 1- **Fever, weight loss, night sweat or anemia.**
- 2- **2nd varicocele** which doesn't empty by elevation of the scrotum.
- 3- **Systemic (Para-malignant syndrome)**
 - **Hypercalcemia** :
In 5 % of cases due to secretion of parathormone like substance by the tumor or bone metastasis.
 - **Polycythemia** :
Due to increased renal erythropoietin
 - **Amyloidosis** .

INVESTIGATIONS

1. Laboratory investigations

- Urine analysis for R B Cs & malignant cells
- Blood urea & serum creatinine.

2. Radiological investigations

1- Plain x-ray :

- may shows soft tissue shadow
- + Mottled calcification of the tumor

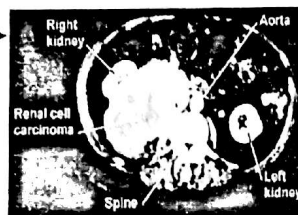
2 - I. V.P : Shows

- Enlargement of the kidney
- Elongation, compression or amputation of a calyx
- Displacement of the renal pelvis.



3- U/S & CT scan (diagnostic)

- Shows size, nature & extent of involvement of surroundings.



3. Metastatic work-up

- e.g. Chest X-ray & bone scan

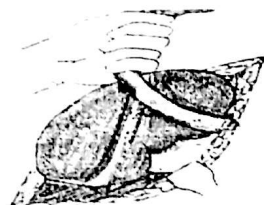
TREATMENT

A- Operable (Stage I & II)

Radical nephrectomy

Removal of

- ① Kidney & supra-renal gland.
- ② The Zukercandle's fascia.
- ③ The peri-nephric fat.
- ④ Regional L.Ns.
- ⑤ Upper 1/3 ureter.



N.B. : Legate the vascular pedicle

As 1st step of operation for 2 reasons :

- 1- Prevention of dissemination of malignant cells during manipulation of the tumor.
- 2- To be able to remove a malignant thrombus from I.V.C if present.

B- Inoperable (Stage III & IV)

- Resectable :

Palliative nephrectomy

- Irresectable :

Chemotherapy (Alpha or Gamma Interferon) & radiotherapy.

2- Wilm's tumor

Nephroblastoma

INCIDENCE

- Represents 10 % of childhood malignant tumors
- Age : 90 % (< 7 years) & the peak (3 - 4 years)
- Sex : Male = female

PATHOLOGY

Site Commonest at upper pole

N/E picture

- Shape : Solitary encapsulated mass.
- Size : Huge size.
- Cut section shows area of hemorrhage & necrosis.

Microscopic picture

Mixed tumor i.e. containing epithelial & C.T cells,

SPREAD

Direct spread To renal pelvis (rare), Zukercandle's fascia.....etc.

Lymphatic spread much less common

Blood spread To lung, bone, brain.....etc.

STAGING (POST- NEPHRECTMY STAGING) for further treatment

- Stage I : Tumor confined to the kidney.
- Stage II : Tumor extends beyond the kidney but completely excised.
- Stage III : Residual tumor confined to abdomen
- Stage IV : Distant metastasis
- Stage V : Bilateral renal involvement at diagnosis

CLINICAL PICTURE

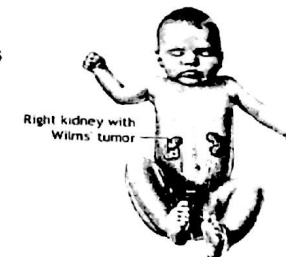
Age 1st 3 - 4 years of life.

Presentation

- 1- Renal mass : In 90 % confined to one side of abdomen
- 2- Hematuria : In 50 % of cases
- 3- Pain : In 40 % of cases.
- 4- Hypertension : It results from renal ischemia & rennin production

Anomalies associated with Wilm's tumor

- 1- Increase the incidence of neurofibromatosis .
- 2- Genito-urinary anomalies
as renal hypoplasia, hypospadias or crypto-orchidism.



INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for R B Cs
- ② Blood urea & serum creatinine

2. Radiological investigations

1- Plain x-ray :

- may shows soft tissue shadow
- + Mottled calcification of the tumor

2 - I. V. P : Shows

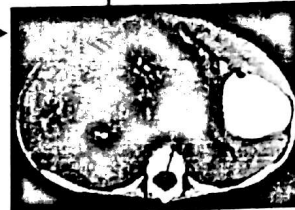
- Enlargement of the kidney.
- Elongation, compression or amputation of a calyx.
- Displacement of the renal pelvis.

3- U/S & CT scan (diagnostic)

- Shows size, nature & extent of involvement of surroundings.

3. Metastatic work-up

- e.g. Chest X-ray & bone scan.

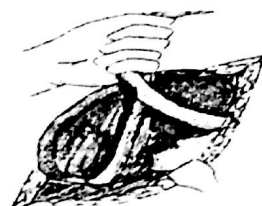


TREATMENT

- Radical nephrectomy if possible

Removal of

- ① Kidney & supra-renal gland.
- ② The Zukercandle's fascia.
- ③ The peri-nephric fat.
- ④ Regional L.Ns.
- ⑤ Upper 1/3 ureter.



N.B. : Legate the vascular pedicle

- As 1st step of operation for 2 reasons :

- 1- Prevention of dissemination of malignant cells during manipulation of the tumor.
- 2- To be able to remove a malignant thrombus from I.V.C if present,

- Irresectable :

Chemotherapy then re-exposure

- because the tumor is usually can be removed

Scheme for post-operative management

- If no residual focal lesion :

- Chemotherapy using Actinomycin D, Vincristin & Adriamycin

- If residual focal lesion :

- Chemotherapy & radiotherapy

B- TUMORS OF RENAL PELVIS

1 - Transitional cell carcinoma

Urothelial tumor

INCIDENCE

- 7 % of renal tumors.

PATHOLOGY

- It is spreading by **implantation** so patient with T.C.C has **30 %** chance of developing the same lesion in the bladder & **2 %** in contra-lateral side.

CLINICAL PICTURE

- Gross or microscopic **hematuria** in **90 %** of cases.

INVESTIGATIONS

A- Laboratory investigations

- Urine analysis, blood urea & serum creatinine

B- Radiological investigations

- 1- I. V. P : shows **filling defect** in renal pelvis.

- 2- U/S & CT scan (diagnostic)



TREATMENT

Total nephro-ureterectomy

- with excision of part of uretro-vesical junction.

2- Squamous cell carcinoma

- It is resulting from metaplasia caused by long standing irritation e.g. **stone**.
- It is associated with **infection**.
- It is usually inoperable & radio-resistant (The worst prognosis).

II- TUMORS OF URINARY BLADDER

Benign

- e.g. Benign papilloma

Malignant

Primary

- 1- Transitional cell carcinoma **55 %**
- 2- Squamous cell carcinoma **40 %**
- 3- Adenocarcinoma **5 %**

Secondary from the surrounding tumors.

Carcinoma of the urinary bladder

Bilharzial carcinoma of the bladder is the commonest malignant tumors in Egypt

INCIDENCE

- Age :
- Sex :

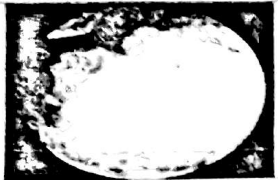
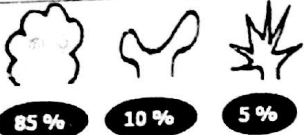
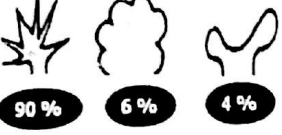
PREDISPOSING FACTORS

PRE-CANCEROUS LESIONS

PATHOLOGY

- Site

- N/E

SQUAMOUS CELL CARCINOMA " BILHARZIAL "	TRANSITIONAL CELL CARCINOMA " NON BILHARZIAL "
	
40 %	55 %
• 20 - 50 years • Male > female	• > 50 years • Male > female
1- Mechanical irritation by the bilharzial ova. 2- Abnormal tryptophan metabolism by bilharzial worm → carcinogenic compounds. 3- Chronic infection by NH3 with bilharzial cystitis lead to squamous metaplasia. 4- ↑↑ B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds	1- Industrial carcinogens : - Aniline dyes. - Aromatic amines. 2- Cigarettes smoking. 3- Pelvic irradiation. 4- Prolonged intake of large doses of phenacetin. 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established "
Brunn's nests, cystitis cystica, cystitis glandularis & squamous metaplasia.	1- Ectopia vesica. 2- Urachal diverticulum
Common in posterior & lateral wall & rarely in the trigone.	Common in base, trigone & around the ureteric orifices
	
• Nodular fungating (85 %) • Malignant ulcer (10 %) • Papillary tumor (15 %)	• Papillary tumor (90 %) • Nodular fungating (6 %) • Malignant ulcer (4 %)

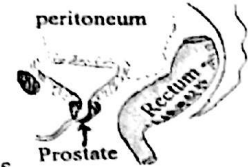
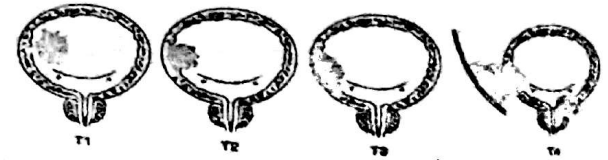
- M/E

SPREAD

Direct

Lymphatic
Blood

STAGING

SQUAMOUS CELL CARCINOMA " BILHARZIAL "	TRANSITIONAL CELL CARCINOMA " NON BILHARZIAL "
Squamous cell carcinoma	Transitional cell carcinoma
	N.B. 1 : According to the degree of cellular differentiation T.C.C. is classified into "B" - Grade I : Well differentiated - Grade II : Moderate differentiated - Grade III : Poorly differentiated N.B. 2 : According to the depth of bladder wall invasion T.C.C. is classified into "B" - Superficial T.C.C - Deep T.C.C : Invading the muscle wall.
Delayed due to calcification	Early as there is no calcification
From mucosa to muscle coat then to the surroundings • Upwards : Peritoneum & bowel • Downwards : Urethra. • Laterally : Pelvic bone. • Posteriorly : - Male → Rectum, seminal vesicle & recto-vesical pouch. - Female → Rectum, vagina & uterus. 	
	From peri-vesical L.Ns → Int. iliac L.Ns → Para-aortic L.Ns
	Late
Wallace classification with squamous cell carcinoma (based on clinical exam.) T₀ : No palpable mass. T₁ : Palpable mobile mass but no induration of bladder wall i.e. no invasion of muscle coat. T₂ : Palpable mobile mass with induration of bladder wall. T₃ : Palpable mobile mass with extra-vesical spread. T₄ : Fixed bladder mass to surroundings.	
	

COMPLICATIONS

C/P

Symptoms

Signs

SQUAMOUS CELL CARCINOMA " BILHARZIAL "	TRANSITIONAL CELL CARCINOMA " NON BILHARZIAL "
1- Uremia & ascending pyelonephritis (cause of death). 2- Obstruction leads to hydronephrosis & hydronephrosis. 3- Uncontrolled hematuria. 4- Distant metastasis.	
With history of bilharziasis 1- chronic cystitis in the form of burning micturition. 2- Painful hematuria.	Without history of bilharziasis 1- painless hematuria. 2- Cystitis is later due to 2 nd infection
Necroturia (tissue sloughs) & supra-pubic dull ache pain.	
- General examination : For uremia & metastasis. - Abdominal examination : For renal mass if hydronephrosis, or splenomegaly if bilharziasis. - P/R & bimanual examination : For site, size, extent & mobility of mass.	

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for R B Cs, **malignant cells** & **necrotic tissues**
- ② Blood urea & serum creatinine .

2. Radiological investigations

1- Plain x-ray :

Shows soft tissue shadow or calcified bladder with squamous cell type only.

2 - I. V.U or ascending cystography

Shows **irregular filling defect** of the bladder. →

3- U/S & CT scan (diagnostic)

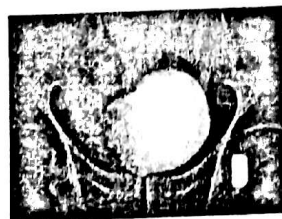
Shows size, nature & extent of involvement of the surroundings.

3- Instrumental (cystoscopy)

To visualize the lesion & to take a biopsy.

4. Metastatic work-up

e.g. Chest X-ray & bone scan.



TREATMENT

According to type of carcinoma :

A- Treatment of squamous cell carcinoma

- In Egypt usually **late** presentation + chemo & radio-resistant tumor .
- So the best is **TOTAL RADICAL CYSTECTOMY + URINARY DIVERSION**
- In the operation, we remove →
 - ① The urinary bladder.
 - ② Overlying peritoneum
 - ③ Peri-vesical fat.
 - ④ Lower 2 inches of ureters.
- Then In male : we remove prostate & seminal vesicles.
In female : we remove uterus, fallopian tubes & ant. vaginal wall.
- Then bilateral Iliac L.Ns dissection occur in both sex.

B- Treatment of transitional cell carcinoma

- According to the **depth of invasion** of the bladder wall .

1 - Superficial (T.C.C)

1. Trans-urethral resection (T.U.R) :

Excision of the tumor with the underlying muscle + multiple mucosal biopsies to detect carcinoma in situ.

2. LASER irradiation :

Using N.d YAG laser through cystoscope.

3. Intra- vesical chemotherapy :

To prevent recurrence, it is used with grade II & III tumors.

N.B.: Regular follow up for 5 years to detect recurrence so if recurrence occur we do **radical cystectomy**.

2 - Deep (muscle invasive) (T.C.C)

1. **Radical cystectomy** : differs from that described for S.C.C in only one step, the urethra has to be removed because of the tendency of (T.C.C) to spread along the urethra.

2. Radio-therapy :

The results are less successful than surgery.

3. Chemotherapy :

For metastasis.

The best combination is "M.V.A.C "

- Methotrexate
- Vinblastine
- Adriamycin
- Cis-platin

URINARY DIVERSION

INDICATIONS

- 1- Cystectomy, ectopia vesica & irremovable obstruction.
- 2- Loss of sphincteric control.
- 3- Incurable vesico-vaginal fistula.

METHODS

I- Uretro-cutaneous implantation

- It is **rarely** performed nowadays
- It has the following disadvantages :
 - ① Stomal stenosis.
 - ② Ascending infection of the kidney.
 - ③ Excoriation of skin by continuous urine leak.

II- Uretro-colic anastomosis It is simple & rapid

- The 2 ureters are anastomosed to sigmoid colon
- It has the following disadvantages :
 - ① Recurrent upper urinary tract infections.
 - ② Deterioration of renal function.
 - ③ Hyper-chloremic acidosis as a chlorides in urine can be absorbed by colonic mucosa.
 - ④ Hypokalemia.
 - ⑤ Encephalopathy : Urea in urine is act upon the intestinal flora leading to formation of excess ammonia .
 - ⑥ Carcinoma of the colon 30 % after 10 years.

III- Ileal conduit

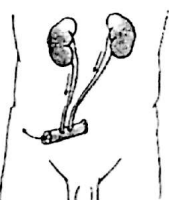
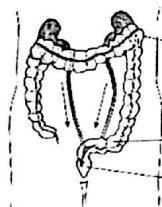
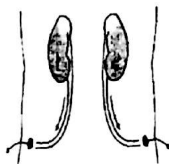
- A segment of terminal ileum is isolated with intact blood supply. the 2 ureters are implanted in it then the distal end of ileal loop is closed & the proximal end of ileal loop is fixed to skin.
- It has the following advantages :
 - No urine leakage & no infection
- It has the following disadvantages :
 - Hyper-chloremic acidosis may occur but is less severe than uretro-colic Anastomosis.

IV - Rectal bladder

- The sigmoid colon is divided above the recto-sigmoid junction. then the distal end is closed & the proximal end is brought out as colostomy.
- The 2 ureters are implanted in the rectum which will now work as a urinary bladder.

V- Continent urinary diversion (Recto-cystoplasty)

- The idea is to separate a segment of bowel with its blood supply & anastomoses this segment to the bladder neck or the remnant of urethra to perform a new urinary bladder.



III- TUMORS OF PROSTATE

Cancer prostate

INCIDENCE

The commonest malignant lesion affecting males > 65 years.

AETIOLOGY Unknown

But it is probably related to long standing androgen stimulation.

PATHOLOGY

- **Site** : The majority of neoplasm (75 %) arise from the **peripheral zone**.
- **N/E picture** : Hard irregular nodule with areas of Hge & necrosis.
- **Microscopic picture** :
 - 95 % Adenocarcinoma.
 - 5 % Transitional carcinoma from prostatic urethra.



Normal prostate



Prostate cancer

SPREAD

Direct spread

To seminal vesicles, peri-prostatic tissues & rarely to rectum because of strong (fascia of Denonvillier) between rectum & prostate.

Lymphatic spread

To internal & external iliac L.Ns → Para-aortic L.Ns.

Blood spread

90 % are bone metastasis (Ribs, lower vertebrae, pelvis, neck of femur) they are usually **osteoblastic**

N.B.: Bone metastasis is due to the reversal of blood flow from vesico- prostatic venous plexus to the valveless emissary veins of the pelvic bone during coughing.

STAGING T N M

T = Tumor	N = Nodes	M = Metastases
T ₀ = No mass.	N ₀ = No L.Ns	M ₀ = No metastasis
T ₁ = Nodule in the lobe	N ₁ = Involvement one regional L.Ns.	M ₁ = Metastasis
T ₂ = Diffuse disease.	N ₂ = Involvement several regional L.Ns.	
T ₃ = Extension to seminal vesicles.	N ₃ = Fixed regional L.Ns.	
T ₄ = Lesion is fixed to other tissues.	N ₄ = Involvement of common iliac or para-aortic L.Ns	

CLINICAL PICTURE There are different presentations of this disease

1- Pathological surprise :

Diagnosed clinically as S.E.P & discovered by histopathology after enucleation as to be cancer

2- Urinary outflow obstruction :

Short history of difficulty, incontinence, hematuria or painful micturition in male > 65 years

3- Metastasis : May be 1st presentation i.e. occult carcinoma.

- ① **Metastasis to spine :** Backache, pathological fracture or paraplegia.
- ② **Invasion to sciatic nerve :** Sciatica.
- ③ **Invasion to iliac veins :** Edema of one or both legs.

4- P/R examination : shows

- Irregular surface .
- Hard in consistency
- Asymmetrical enlargement.
- Sulci between lobes are obliterated.
- Inability to slide rectal mucosa over the prostate .



INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis, blood urea & serum creatinine
- ② **Prostatic specific antigen (PSA)**
The most useful marker in the diagnosis & follow up but it may be raised in S.E.P or prostatitis.
- ③ **Acid phosphatase enzyme :** (N = 0 - 3 king/Armstrong unites)
So - If 3 - 5 units are suggestive.
- If 5 - 10 units are diagnostic.
- If > 10 units it means metastasis.
- ④ **Alkaline phosphatase enzyme :** ↑↑ with bone & liver metastasis .

2. Radiological investigation

1- I. V. U :

Shows irregular filling defect at base of the bladder

2- Bone scan :

Hot spots indicates metastasis.

3- CT scan pelvis :

To detect pelvic L.Ns deposits but not accurate.

2. Trans-rectal ultrasound (T.R.U.S)

To detect non palpable malignancy in peripheral zone.

3. Metastatic work-up

e.g. Chest X-ray & bone scan.

TREATMENT

1- Radical prostatectomy

Indicated only with localized disease & fit patient

2- Irradiation

Indicated only with advanced disease & unfit patient, also if symptomatic metastasis as it produces dramatic relief of pain.

3- Trans-urethra resection

Indicated only with patients who have urinary out-flow obstruction & unfit for major surgery i.e. palliative treatment.

4- Hormonal therapy

for (majority of cases)

Cancer prostate is an androgen sensitive tumor so there are different methods of androgen ablation.

- ① Bilateral orchidectomy.
- ② Luteinizing hormone releasing hormone (LHRH) agonist (**Zoladex**)
the drug causes initial rise of testosterone then a drop to castrate level .
- ③ Anti-androgens (**Nutrilamide**) .
They act by blocking testosterone receptors by competitive inhibition.
- ④ **Stilbesterol** A small dose 1 mg t.d.s is used.

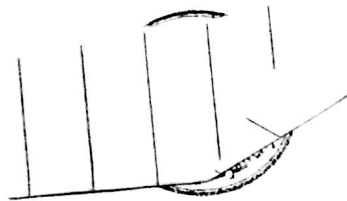
PROGNOSIS

Early cases without metastasis

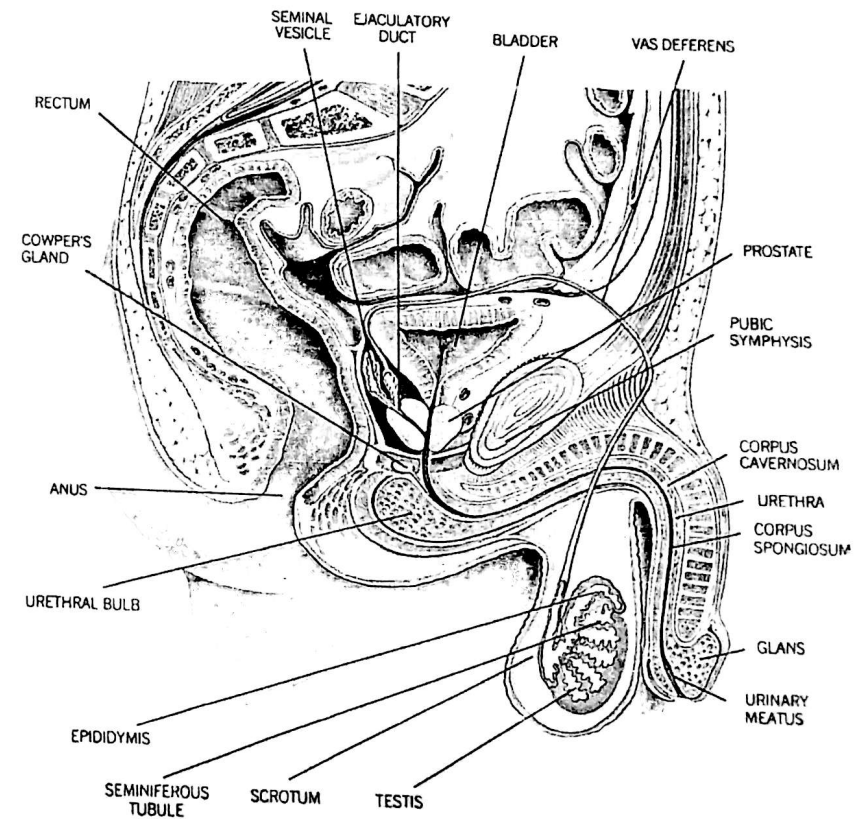
Have good prognosis (the minority).

Late cases with metastasis

Have poor prognosis (the majority)



TESTIS & SCROTUM



TESTIS & SCROTUM

EMBRYOLOGY

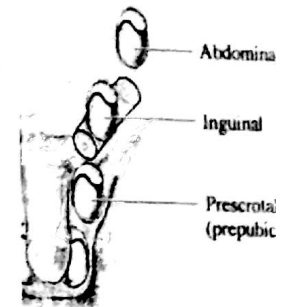
- It arises in lumbar region from the mesodermal genital ridge deriving its blood supply from aorta & it's nerve supply from T₁₀ - T₁₂ segments. *apdx - 3 Jan 16*
- It migrates downwards, forwards & medially, pass through the inguinal canal carrying with it a fold of peritoneum (**PROCESSUS VAGINALIS**).

N. B.: The testis reaches the following :

The internal ring at 6th month (intra-uterine).

The external ring at 8th month (intra-uterine).

The bottom of scrotum at 9th month *just before birth*

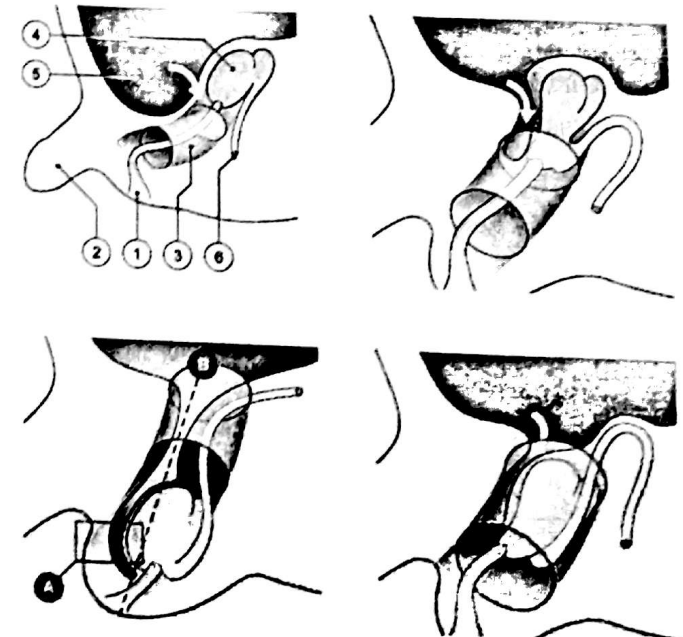


FACTORS RESPONSIBLE FOR TESTICULAR DESCENT

- 1- **Cranial segment** of the body grows faster than caudal segment.
- 2- **Maternal & pituitary gonadotropin (HCG).**

3- Gubernaculum

Which is a **fibro-muscular band** connecting the lower pole of the testis to the bottom of the scrotum guiding the testis into the scrotum



I- CONGENITAL ANOMALIES

Imperfect descent of the testis

- 1- Undescended Testis
- 2- Ectopic Testis
- 3- Retractable Testis

1. Incompletely descended testis

Undescended testis

INCIDENCE

- 1 % of all males (especially in premature)
- Common at Rt. side.
- 20 % Bilateral = Crypto-orchidism.

AETIOLOGY

A- Hormonal deficiency

Due to HCG hormone deficiency

B- Mechanical factors

- ① Large sized testis & epididymis.
- ② Shortness of the spermatic vessels of the vas deferens.
- ③ Adhesions fixing the testis in higher places.
- ④ Rupture of gubernaculum

PATHOLOGY

The testis arrest any where along the normal line of descent.

- ① In the abdomen.
- ② In the inguinal canal.
- ③ At the external ring.
- ④ At the neck of the scrotum.

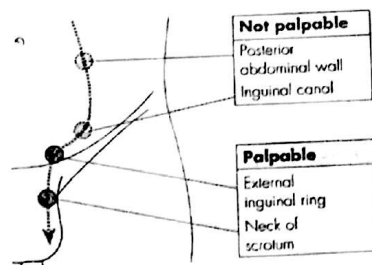
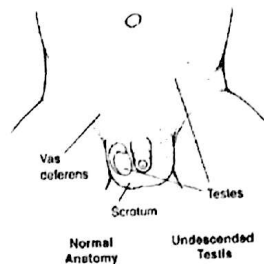
COMPLICATIONS

A- Local complications

- 1- **Sterility** in bilateral cases due to failure of spermatogenesis from higher abnormal temp.
- 2- **Severe pain ± shock** if torsion testis occur.
- 3- **Recurrent trauma** leads to atrophy of testis especially if inguinal.
- 4- **Oblique inguinal hernia** in 75 % of cases.

B- General complications

- 1- **Psychological** disturbance.
- 2- **Epididymo-orchitis**.
- 3- **Testicular malignancy** especially if intra-abdominal.



CLINICAL PICTURE

- The ipsilateral side of scrotum is **empty & undeveloped**
- The testis may be felt in abnormal place (**along normal line of descent**)
- An **associated hernia** may be present.

D.D From ectopic & retractile testis (see next page)

INVESTIGATIONS

- 1- **Hormonal assay** e.g. L.H & testosterone in the blood, to exclude causes of anorchia in bilateral cases (i.e. crypto -orchidism)
- 2- **U/S & CT scan** To localize the site of testis.
- 3- **Laparoscopy** To detect intra-abdominal testis.

TREATMENT

Surgical Treatment (Orchidopexy)

TIMING Best age between 1- 2 years.

ANESTHESIA General

POSITION Supine

INCISION Inguinal incision to open the inguinal canal

STEPS

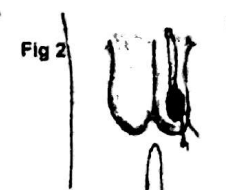
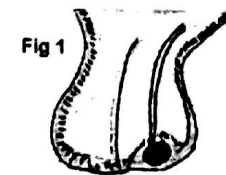
A - Mobilization of the vas deferens & testicular vessels

- Any associated hernia is dealt with.
- Cord elongation by dissecting it high up & cutting any bands.
- Inferior epigastric artery may be divided to abolish angulation of the vasa around it.

The aim of the above mentioned steps is to gain length of spermatic cord & help testicular descent.

B - Fixation & Retaining the mobilized testis in the scrotum

- 1- **Dartos pouch** : By putting the testis between the skin of scrotum & dartos muscle (see fig .1).
- 2- **Bevan's operation** : A stitch is passed from tunica albuginea to the skin of scrotum (see fig. 2).
- 3- **Ombredanne's operation** : The mobilized testis is brought through an opening in the septum (see fig. 3)



2- Ectopic testis

DEFINITION

Testis which normally developed, passed out the external ring, but instead of reaching the scrotum, it passes a subcutaneous **ectopic** position.

AETIOLOGY

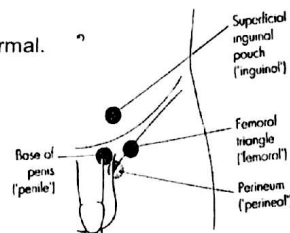
It may be due to pull of an **accessory gubernaculum**

PATHOLOGY

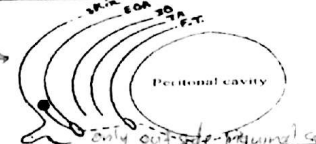
• The hormonal & spermatogenic functions are normal.

• The sites of ectopic testis :

- ① **Inguinal** : Superficial to the aponeurosis of the muscle
- ② **perineal**.
- ③ **Pubo-penile** : Root of the penis.
- ④ **Femoral** : In the femoral triangle.



D. D

ECTOPIC (DEVIATED)	UNDESCENDED (ARRESTED)
 Peritoneal cavity <i>only outside inguinal canal</i>	 <i>inside inguinal canal</i>
- ON STRAINING (muscle contraction), the testis becomes MORE apparent. - The testis can be PUSHED MEDIALY but not laterally. - The testis can be PUSHED to bottom of scrotum. <i>normal size well developed</i>	- ON STRAINING, the testis becomes LESS apparent - The testis can be PUSHED LATERALLY but not medially. - The testis CAN'T BE PUSHED to bottom of scrotum. <i>small sized not well developed</i>

TREATMENT

Replacement of the testis in the scrotal bed.

3- Retractable testis

⇒ The condition occurs in young child due to exaggerated cremasteric reflex.

⇒ It can be differentiated from undescended by

- ① The scrotum is **well** developed.
- ② The testis can be pushed into scrotum with squatting position or (chair test)

⇒ No treatment is required.



II- INGUINO-SCROTAL DISEASES

1- Varicocele

DEFINITION

It is multiple, dilated, elongated & tortuous veins of pampiniform plexus.

1st Varicocele

AETIOLOGY

- ① Congenital weakness of wall of veins
- ② Congenital absence of valves.
- ③ Prolonged sitting or standing.
- ④ Chronic constipation or straining at stool.
- ⑤ Unrelieved sexual desire.

SITE

It occurs at Lt. Side (95%) why? Because

- ① LT, TESTICULAR VEIN opens into the Lt. renal vein at right angle which has no protective valves.
- ② LT, TESTICULAR VEIN lies beneath the sigmoid colon & so liable to compression.
- ③ LT, TESTICULAR VEIN be longer because the Lt. testis usually lies at lower level

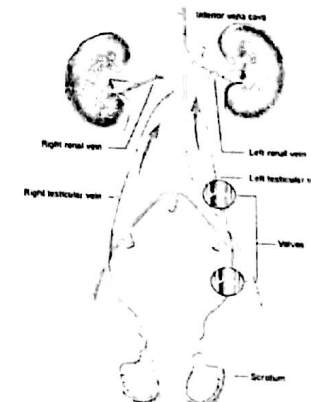
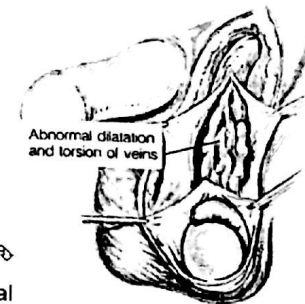
COMPLICATIONS

- ① **Infertility** especially bilateral can reduce the sperm count or vitality. This is due to the higher temperature in the scrotum produced by venous congestion.
- ② Recurrent attacks of **thrombophlebitis**.
- ④ **Testicular atrophy**
- ⑤ **Neurosis**.

EXAMINATION

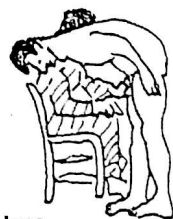
A- Inspection

- 1- **Swellings** are multiple, elongated & tortuous inguino-scrotal swelling, commonly at Lt. side.
- 2- **Sagging** skin over.
- 3- **Inguinal region** may shows O.I.H as a weak mesenchyme.
- 4- **Scrotum** shows Lt. side hangs lower than Rt. side.
- 5- **Penis** shows no anomalies



B- Palpation

- 1- **Swellings** are multiple, elongated & tortuous inguino-scrotal swelling, commonly at Lt. side. with **palpable thrill** on cough due to reversed venous flow
 - 2- **Tender skin** over if thrombophlebitis.
 - 3- **Inguinal region**
 - 4- **Scrotum.**
 - 5- **Penis**
- } as inspection
- 6- **Tunica vaginalis** may show minimal effusion which is tested by "**pinching test**".
 - 7- **Testis** : May be small & soft if atrophied.
 - 8- **Epididymis** : normally felt.
 - 9- **Spermatic cord** : We felt bag of worms



C- Special test (BOW TEST)

If the examiner lightly holding the varicocele between the fingers & thumb, then the patient is instructed to bow. The tension within the veins becomes obviously less

INVESTIGATIONS

- 1- **Doppler & duplex scan** can detect reversal of the blood flow in testicular vein (incompetent valves).
- 2- **Semen analysis** : In case of infertility.

TREATMENT

A- Conservative treatment

- ① Avoid straining & treatment of constipation.
- ② Scrotal suspender better avoided
- ③ Sexual life is regulated
- ④ Patient takes frequent cold paths.

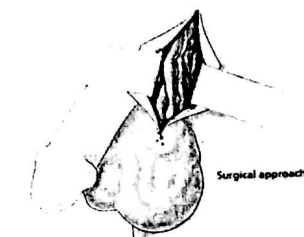
B- Surgical treatment

INDICATIONS

- ① Large sized painful varicocele.
- ② Oligospermia
- ③ Failure of medical treatment.

PRINCIPLES

- ① Trans-fixation excision
- ② Multiple ligature (**Delta**) operation.
- ③ High abdominal (**Palomas**) ligation.

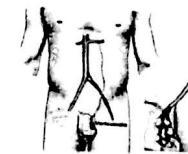


See operative details

2^{ry} Varicocele

AETIOLOGY

It is due to obstruction of testicular veins high up in abdomen as hypernephroma or after herniorrhaphy



	1 ^{ry} varicocele	2 ^{ry} varicocele
> Age.	• 15 - 25 years	• > 40 years
> Site.	• Usually Lt.	• Usually bilateral.
> On lying down.	• Disappears	• Partially disappear
> Abdominal exam.	• No swelling.	• Present e.g. hypernephroma.

INVESTIGATIONS

- 1- **Doppler & duplex scan** can detect reversal of the blood flow in testicular vein (incompetent valves).
- 2- **Semen analysis** : In case of infertility.

TREATMENT

Treatment of the cause

2- Hydrocele

DEFINITION

It is a collection of fluid in the tunica vaginalis or processus vaginalis.

CLASSIFICATION

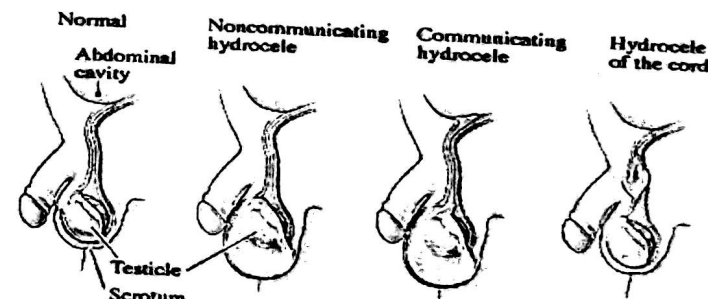
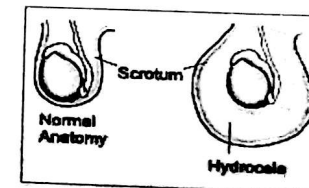
It may be

1- Hydrocele of the tunica vaginalis

Congenital, infantile & vaginal hydrocele (1^{ry} or 2^{ry})

2- Hydrocele of the spermatic cord

Encysted hydrocele of hernial sac, diffuse hydrocele of the cord & hydrocele of hernial sac



A- Hydrocele of tunica vaginalis

1- Congenital hydrocele

DEFINITION

Processus vaginalis remains patent & connected by a small opening to peritoneal cavity, so not allow development of hernia.

CLINICAL PICTURE

- **Age** : In infants (few months).
- **Symptoms** : Inguino-scrotal swelling with change in size i.e. ↓↓ in early morning & ↑↑ at end of day.
- **Signs** : Cystic & translucent inguino-scrotal swelling

TREATMENT

- **UPPER PART** : Transfixed as treatment of hernia.
- **LOWER PART** : Everted as treatment of hydrocele.



2- Infantile hydrocele

DEFINITION

As congenital type but **no** connection to peritoneal cavity

CLINICAL PICTURE

- **Age** : **Not** necessarily in infant
- **Symptoms** : Inguino-scrotal swelling with **no** change in size.
- **Signs** : Cystic & translucent inguino-scrotal swelling

TREATMENT

Everted as treatment of hydrocele..



3- Vaginal hydrocele

1st vaginal hydrocele

DEFINITION

Collection of fluid in the tunica vaginalis only.

CAUSES

Unknown but may be due to irritation by repeated trauma

PATHOLOGY

Hydrocele fluid :

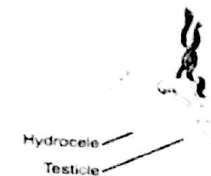
H₂O, salts, albumin & fibrinogen



Testicle

CLINICAL PICTURE

- **Age** : Middle aged & elderly male
- **Symptoms** : Scrotal swelling
- **Signs** : ① Cystic & translucent scrotal swelling (you can get above it)
② Dull on percussion.
③ By transillumination it is translucent.



COMPLICATIONS

- ① **Pyocele** : If infection.
- ② **Calcification** of sac.
- ③ **Hematocele** : If trauma or attempts for aspiration.
- ④ **Interfere** for daily activity.
- ⑤ Huge expansion of the scrotum leading to indrawn of the penis which may interfere with intercourse



D. D Pyocele, hematocele & chylocele.

TREATMENT

A- Aspiration (Better avoided)

- Indicated when an operation cannot be done e.g. old age

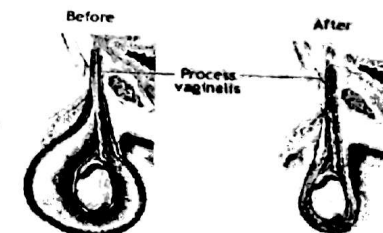
- Complicated by hemorrhage, infection, testicular atrophy & recurrence.

B- Surgical treatment

PRINCIPLES

- ① Eversion of tunica.
- ② Excision of tunica.
- ③ Lord's operation

See operative details



2nd vaginal hydrocele

CAUSES 2nd to 3rd

- **Acute** : Acute epididymo-orchitis & endemic funiculitis.
- **Chronic**

- ① **Testis** : \$ or malignant tumors.
- ② **Epididymis** : T.B, bilharzial or filariasis.
- ③ **Spermatic cord** : Varicocele, bilharziasis or filariasis.
- ④ **Post operative** : After varicocele or hernia operation.



TREATMENT

- **Treatment of the cause**

B- Hydrocele of the spermatic cord

1- Encysted hydrocele of the cord

- It is due to persistence of the middle part of the processus vaginalis
- It is **scrotal** swelling.
- The mass separated from testis by gap (D.D SPERMATOCELE).
- It moves side to side and not up & down.
- The characteristic sign** : Gentle traction upon the testis the swelling moves down so becomes less mobile
- Treatment** : Excision through an inguinal incision.

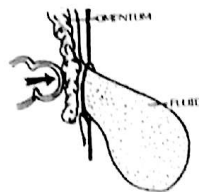


2- Diffuse Hydrocele of the Cord

- It is a diffuse cord swelling due to chronic lymphatic obstruction.
- Caused by** filariasis.
- Treatment** : Excision is difficult & unnecessary.

3- Hydrocele of hernial sac

- It occurs in narrow necked sacs becomes occluded by omentum or adhesions after reduction of its contents → collection of serous fluid in the sac.
- Cystic translucent inguino-scrotal swelling.
- Treatment** : Excision through an inguinal incision.



3- Hematocele

Accumulation of **blood** in the tunica vaginalis

A- Recent hematocele

- It is due to ① Injury of blood vessels during aspiration.
② Trauma of the testis.
- It is a painful, non translucent mass
- Treatment** : Urgent evacuation of blood & excision of tunica



B- Old clotted hematocele

- It is due to neglected recent cases.
- It is a painful, non translucent mass + **hard** in consistency & may be complicated by testicular atrophy.
- Treatment** : - **Early cases** : Dissection of clot from testis & excision of tunica can be done.
- **late cases** : Orchidectomy.

III- TESTICULAR TUMORS

INCIDENCE

- 99 %** of testicular neoplasm are malignant.
- They constitute **1- 2 %** of malignant tumors in males.

PREDISPOSING FACTORS

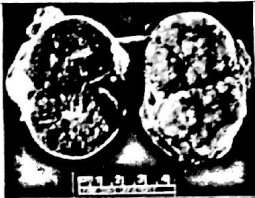
- The incidence increases **15 times** in undescended testis.
- Surgery for undescended testis does not prevent the susceptibility to malignancy

CLASSIFICATION

- Seminoma** (40 %)
- Teratoma** (32 %)
- Combined seminoma & teratoma (14 %)
- Interstitial cell tumor (1.5 %)
- Lymphoma (7 %)
- Other tumors (5.5 %)



	Seminoma	Teratoma
Origin	Arising from seminefrous tubules.	Arising from embryonic totipotent cells giving rise to ectoderm, mesoderm & endoderm.
Age	Older age	Younger (20 - 35 years)
Pathology - N/E :	- The enlarged testis is firm & smooth - Non capsulated	- The enlarged testis is variable consistency & irregular - Non capsulated
- Cut section :	- Homogenous, fibrous septa give lobulated shape. - Areas of Hge & necrosis.	- Heterogenous with multicystic mass. - Areas of Hge & necrosis.
- M/P :	The cells : Rounded with large rounded nuclei arranged in sheets. The stroma : shows fibrous tissues infiltrated by lymphocyte 	1- Teratoma differentiated (T.D) : dermoid cyst 2- Malignant teratoma intermediate (M.T.I) the most common. 3- Malignant teratoma anaplastica (M.T.A). 4- Malignant teratoma trophoblastica (M.T.T) : the most malignant

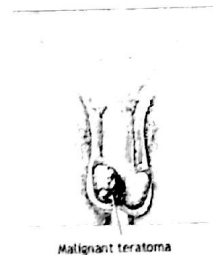
	Seminoma	Teratoma
		
Growth	- Slow rate	- Rapid rate
Malignancy	- Lower	- Higher.
Spread	- Mainly (not only) lymphatic.	- Mainly (not only) blood
Irradiation	- Radiosensitive.	- Radioresistant.
Prognosis	- Relatively good.	- Bad prognosis

SPREAD

Direct To the rest of testis then to the surroundings as epididymis, tunica ... etc.

Lymphatic (mainly with **seminoma**).
To para-aortic L.Ns → cisterna chyli
→ Thoracic duct → Virchow's gland.

Blood (mainly with **teratoma**)
To the lung, bone, liver & brain.



STAGING

- **Stage I** : Tumor in the testis only.
- **Stage II** : Tumor + involvement of L.Ns **below** the diaphragm (Para- aortic)
- **Stage III** : Tumor + involvement of L.Ns **above** the diaphragm (Virchow's)
- **Stage IV** : Distant metastasis.

CLINICAL PICTURE

A- Typical picture

- Symptoms :

- ① Painless enlargement of testis
- ② sense of heaviness.

- Signs :

- ① **The testis** : Enlarged with slippery edge & early loss of testicular sensation.
- ② **Abdominal examination** for para-aortic L.Ns.
- ③ **Lt. supra-clavicular region** for Virchow's gland.

B- Metastatic picture 1ST presentation, i.e. Occult carcinoma

- **Seminoma** → Epigastric mass i.e. para-aortic L.Ns.
- **Teratoma** → Hemoptysis, dyspnea ... etc. i.e. lung metastasis

C- Atypical picture

- ① Some cases may simulate **acute epididymo-orchitis**
(Acute pain with swelling may be due to hemorrhage)
- ② **The Hurricane type** : Fatal in few weeks.

D. D (Loss of testicular sensation)

- ① Testicular tumors.
- ② Syphilitic infection i.e. Gumma of testis.
- ③ Old clotted hematocele.

INVESTIGATIONS

A- Laboratory

Tumor markers

Beta HCG & alpha feto-protein

B- Radiological

- 1- **Plain x-ray** (chest) for metastasis
- 2- **Scrotal U/S** (diagnostic)

C- Instrumental

Testicular biopsy

The scrotum should never be opened to get a needle biopsy to prevent opening of alternative way for lymphatic spread

So An **inguinal incision** is made then a vascular clamp is applied to the cord at the deep ring & then the testicle is delivered.

So **Wedge biopsy** is taken with frozen section



TREATMENT

A- Retrograde high simple orchidectomy

- Through inguinal incision the inguinal canal is opened then the spermatic cord is isolated at the internal ring.
- Finally the testis is excised.

B- Further treatment

1- SEMINOMA :

- **Stage I & II** : Radiotherapy to para-aortic L.Ns.
- **Stage III** : Radiotherapy extends to Lt. supra-clavicular L.Ns.
- **Stage IV** : Chemotherapy.

2- TERATOMA :

- **Stage I** : Follow up by tumor markers.
- **Stage II, III & IV** : Chemotherapy.

PROGNOSIS

- **SEMINOMA** : Relatively good
- **TERATOMA** : Bad prognosis

IV- TORSION OF THE TESTIS

DEFINITION

It means torsion of the testis & epididymis around the axis of the spermatic cord.

PREDISPOSING FACTORS

- ① Imperfect descent of the testis (incomplete or ectopic)
- ② Long mesorchium (see fig .1).
- ③ Capacious tunica vaginalis.
- ④ Polar anteversion of the Testis (see fig .2).
- ⑤ Spirally arranged cremasteric muscle (see fig .3).

Fig 1

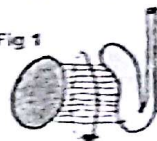


Fig 2



Fig 3



EXCITING CAUSES

Minor trauma or straining at defecation leads to twist of the spermatic cord.

PATHOLOGY

- **TESTIS** : Rotates from outside inwards
- **SPERMATIC CORD** : shows the twists, if torsion persists, the blood vessels are thrombosed & gangrene occurs within 8 -12 hours
- **TUNICA** : Small 2nd hydrocele or hematocele.
- **SCROTUM** : Red & edematous.



CLINICAL PICTURE

- **SYMPTOMS** :
 - ① Sudden severe agonizing pain in the groin & lower abdomen.
 - ② It may be presented by neurogenic shock + vomiting
- **SIGNS** :
 - ① The scrotum is swollen & the overlying skin is edematous & red.
 - ② The testis is higher than normal & sometimes the twists are felt in the cord.

D. D (1)

	TORSION OF SPERMATIC CORD	ACUTE EPIDIDYMO-ORCHITIS
AGE	Adolescents or children	Adults or elderly
HISTORY	Mild trauma	U.T.I symptoms
TEMPERATURE	Normal	Elevated
ELEVATION OF SCROTUM	Dose not relieve pain	Relieve pain
URINE ANALYSIS	Free	May show pus cells
DOPPLER & DUPLEX	Obstructed testicular vessels	Patent testicular vessels

D. D (2)

	TORSION OF UNDESCENDED TESTIS	STRANGULATED INGUINAL HERNIA
TENSE & TENDER	Absent	Present
EMPTY SCROTUM	Present	Absent

INVESTIGATION

- **DOPPLER & DUPLEX SCAN** : To detect the thrombosed vessels.

TREATMENT (Urgent)

- 1- **VIABLE TESTIS** :
Untwist the cord & fix the testis to the scrotum to prevent recurrence then eversion of tunica
- 2- **GANGRENOUS TESTIS** :
Orchidectomy above the twist.



V- INFLAMMATIONS OF THE TESTIS

& SPERMATIC CORD

1- Acute inflammation

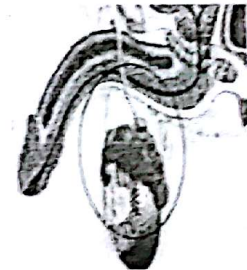
Acute Epididymo- orchitis

AETIOLOGY

- Organism : E coli, staphylococci, streptococci ... etc.
- Source of infection : urethra, prostate & seminal vesicle.
- Routes of Infection :
 - ① Blood borne infection.
 - ② Descending via lumen of vas 2nd to urethritis, proctitis ... etc.

CLINICAL PICTURE

- **SYMPTOMS** :
Acute severe inguino-scrotal pain.
- **SIGNS** :
 - General : Fever, Headache, Malaise & Anorexia.
 - Local : The epididymis and testis are swollen, hot & tender with edematous scrotal skin with 2nd hydrocele.



INVESTIGATION

- **URINE ANALYSIS** may show pus cells

TREATMENT

- General : Rest in bed with antibiotics after culture & sensitivity test.
- Local : Incision & drainage of pus if present.

2- Chronic inflammation

	① BILHARZIASIS	② FILARIASIS	③ TUBERCULOSIS
AETIOLOGY	① Hematobium worms ② Manson worms	It is usually follow acute funiculitis.	① 2 nd urinary T.B ② Sometimes blood borne
TYPES	① Granular form ② Nodule form ③ Massive form	① Nodule type ② Diffuse type	
C/P			
History	Bilharziasis.	Filariasis.	Tuberculosis
Site	Lower part of cord	Any part of cord	Tail of epididymis.
Epididymis	Affected if massive	Not felt if chylocele.	Early tender, hard mobile mass Late : Cold abscess which may burst → T.B sinus at posterior wall of scrotum.
Cord & Vas	Nodular vas	Matted cord	Beaded vas.
Tunica	2 nd hydrocele	Chylocele	2 nd hydrocele.
Scrotum	Normal	Thickened & hypertrophied	Ulcerate posteriorly i.e. T.B. sinus.
P/R	⊘ affects prostate & seminal vesicle	Free	T.B affects prostate & seminal vesicle
INVESTIGATION			
Urino	+ve ova	Free	Free
Blood	Free	Night film +ve	Free
Tuberculin	Free	Free	+ve Test
TREATMENT			
General	Anti-⊘ drugs.	Anti-filarial drugs	Anti-T.B drugs.
Local	Excision of mass	Excision of mass	Epididymo-vasectomy

④ SYPHILIS

• SYPHILITIC ORCHITIS may be

- ① Diffuse interstitial fibrosis
- ② Bilateral orchitis : Usually congenital.
- ③ Solitary gumma of testis : Painless mass with loss of testicular sensation, later on ulcerate anteriorly.

VI- CYST OF THE EPIDIDYMS

Spermatocele

DEFINITION

It is a retention cyst in head of epididymis 2nd to obstruction of vas.

PATHOLOGY

The cyst contains white fluid in which living & dead sperms can be identified.

CLINICAL PICTURE

• SYMPTOMS :

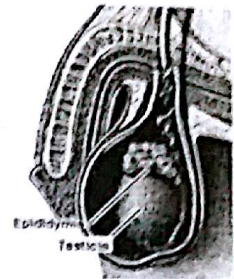
Asymptomatic as it is small or less frequently the patient imagine that he has 3 testicles.

• SIGNS :

Globular transopaque smooth swelling lying just above & behind the upper pole of testis with (no gap) between them, i.e. DD encysted hydrocele of cord.

TREATMENT

ASPIRATION or EXCISION



VII- IDIOPATHIC GANGRENE OF THE SCROTUM

Fournier's gangrene

DEFINITION

Type of infective gangrene caused by hemolytic streptococci + E-coli.

PATHOLOGY

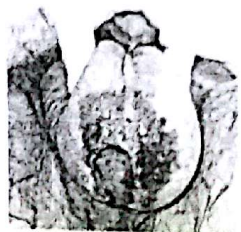
Starts as inflammatory skin condition which rapidly progress to gangrene especially in diabetics.

CLINICAL PICTURE

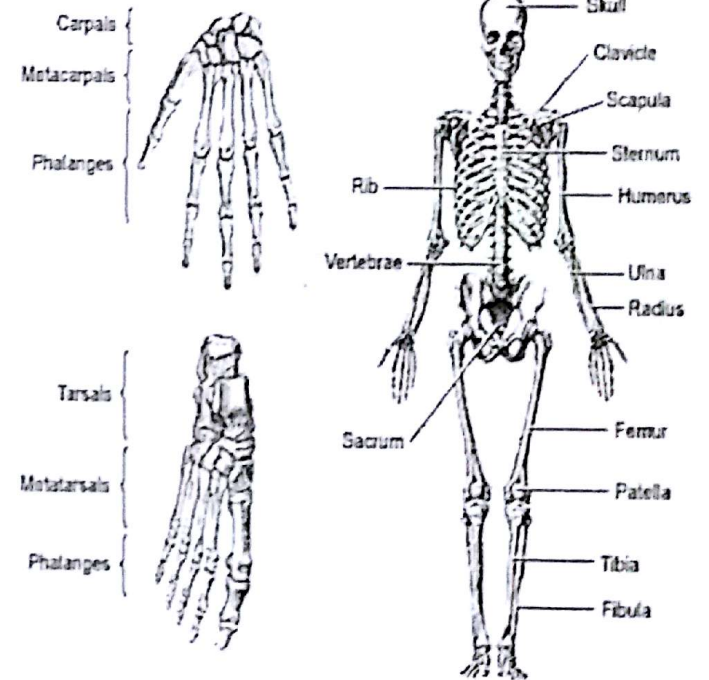
The whole skin of the scrotum may slough (from inflammatory thrombosis of the vessels).

TREATMENT

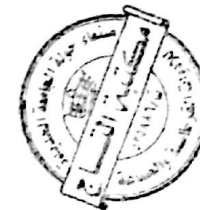
ANTIBIOTICS + REPEATED DRESSINGS until slough separates and early SKIN GRAFTING.



ORTHOPEDICS



Principles of Orthopedics



ORTHOPEDICS

ORTHOPEDICS :

Can be divided into 2

- A - Traumatology (fracture & dislocation)
- B - Bone, joint diseases & deformities.

TRAUMATOLOGY

DEFINITION

- A- **Fracture** Loss of bone continuity
- B- **Dislocation** Loss of contact between 2 articular surfaces.

AETIOLOGY

A- Traumatic fracture

DIRECT TRAUMA

e.g. Direct blow or car accident

- **Fracture one bone** : The bone breaks transversely
- **Fracture both bone** : The both bones breaks at same level.

INDIRECT TRAUMA

e.g. Fall on the out-stretched hand or fall from a height.

- **Fracture one bone** : The bone breaks obliquely
- **Fracture both bone** : The both bones breaks at different level

AVULSION TRAUMA

Due to severe muscle contraction, e.g. fracture of patella.

B- Pathological fracture

DEFINITION

Multiple fractures due to minor & recurrent trauma at a pathological bone due to generalized or localized bone disease.

AETIOLOGY

> **Congenital** : Osteitis fragilis (↓ osteoid tissue) & congenital cysts

> **Inflammatory** :

- ① Chronic osteomyelitis.
- ② T.B osteomyelitis.
- ③ Gumma in the bone.

> **Endocrinal** :

- ① Hyperparathyroidism (osteitis fibrosa cystica).
- ② Cushing syndrome.
- ③ Menopausal causes. (osteoporosis)

> **Rickets** : Due to vitamin D deficiency or renal rickets.

> **Neoplastic** : 1st tumor or metastasis.

*Investigation of the cause, e.g. serum Ca - parathyroid gland.
It must be fixed by internal fixation.*

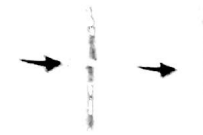
Bone is fragile due to ↓ of osteoid tissue while its mineral content is normal.



CLASSIFICATIONS

A- The fractures are either complete or incomplete

- **Complete** : Total loss of bone continuity
- **Incomplete** : The cortex is broken from one side as fissure fracture or green stick fracture



B- Fractures are either simple or compound

- **Simple fracture** without an external skin wound.
- **Compound fracture** with an external skin wound. Which may be 2
 - ① **Compound from without** : i.e. the causative trauma leads to skin wounds & fractures.
 - ② **Compound from within** : i.e. the fractured end of bone is the cause of skin wound.
 - ③ **A break in the skin surface** : i.e. due to skin death from ischemia



C- Classification according to the shape of fractures

- Transverse fracture
- Oblique fracture
- Spiral fracture
- Greenstick fracture
- Comminuted fracture
- Wedge



CLINICAL PICTURE

- 1- History of trauma.
- 2- Ecchymosis
- 3- Loss of function
- 4- Pain due to friction between bone ends.
- 5- Swelling due to the fracture hematoma & oedema.
- 6- Deformity due to displacement of the fragment by action of muscle

N.B: Types of displacement (deformity)

- 1- **LATERAL DISPLACEMENT :**
The distal segment deviates to one side.



- 2- **ANGULATION :**
Loss of normal long axis of the shaft.



- 3- **OVER-RIDING :**
The distal segment over-rides the proximal segment.



- 4- **IMPACTION :**
The distal segment is impacted at the proximal one.



- 7- **Abnormal mobility & crepitus.**

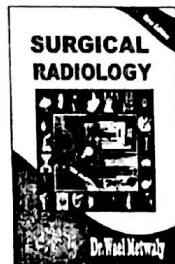
N.B.: Crepitus :

- It is a definite sign of fracture, but don't search for it as this may induce more trauma
- It is absent in cases with incomplete or impacted fracture.

- 8- **Tenderness maximum at site of fracture.**

DIAGNOSIS X-ray

- It must show the bone with joint above & joint below.
- It must be done 3 times :
 - At time of fracture (diagnostic).
 - After fixation to ensure of good reduction.
 - Before removal of plaster to ensure healing.
- It must be 2 views :
 - Antero-posterior view.
 - Lateral view for angulation & over-riding.



COMPLICATIONS OF FRACTURES

A- General complications

Mainly with fracture (**pelvis, femur & spine**).

- 1- **Shock :** Neurogenic & hypovolaemic
- 2- **Hemorrhage :** External or internal.
- 3- **Fat embolism :**
Especially fracture (**femur**)
- 4- **Crush syndrome** leads to acute renal failure.
- 5- **Paralytic ileus & acute gastric dilatation**
Especially fracture (**pelvis & spine**) due to
1- Retro-peritoneal hematoma.
2- Sympathetic over-stimulation.

- 6- **Tetanus** with compound fracture.

7- Complications of prolonged recumbancy

- ① Bed sores.
- ② D.V.T.
- ③ Respiratory complications.
- ④ Pulmonary embolism.
- ⑤ Urinary calculi.
- ⑥ Constipation.
- ⑦ Psychological complications.

B- Local complications

- 1- **Skin** injury with compound fracture.

2- Muscle & tendon :

- Tear or **myositis ossificans** (*see below*)

3- Vascular injury :

- Spasm or contusion or division → Acute ischemia.
- **Volkmann's ischemic contracture** (*see below*)

4- Nerve injuries

5- Bone complications :

- **Mal, delayed or non union** (*see below*).
- **Avascular necrosis**.
Interruption of the blood supply of a bone fragment leading to its necrosis e.g. fracture neck femur.

6- Joint injury :

- e.g. Dislocation, subluxation, sprain, stiffness, effusion, hemo-arthritis & osteo-arthritis.

7- Visceral injury :

- e.g. Rupture bladder or urethra with fracture pelvis.

8- Sudek's atrophy (*see below*).

NOW

We talk about

- 1- Myositis ossificans
- 2- Sudek's atrophy
- 3- Volkmann's ischemic contracture
- 4- Mal, delayed or non union

1- MYOSITIS OSSIFICATIONS

DEFINITION

Heterotropic bone formation in the fleshy part of muscle.

INCIDENCE

It is most often seen after supra-condylar fracture (humerus & femur)

PATHOGENESIS

The hematoma in the injured muscles communicating with the fracture, in which the periosteum has been avulsed so the periosteum migrates from the bone to the muscle hematoma, then the periosteal cells proliferate within the hematoma & ossify.

CLINICAL PICTURE

The condition may be suggested by a failure of the range of movement of the joint e.g. elbow joint

TREATMENT

A- Prophylactic treatment :

Early reduction of fracture & avoid massage or passive exercises.

B- If ossification develops :

Prolong the period of immobilization. This gives the chance for the body to remove it almost completely.

C- If residual mass after prolonged immobilization :

Can be removed surgically



2- SUDEK'S ATROPHY

DEFINITION

It is a syndrome in which there is osteoporosis, swelling of the soft tissue, vascular stasis, pain & joint stiffness complicating a fracture.

INCIDENCE

It is most often seen after Colle's fracture

AETIOLOGY

Unknown

TREATMENT

Physiotherapy, analgesics, splinting & sympathectomy may be indicated



& Pott's fracture



3- VOLKMANN'S ISCHEMIC CONTRACTURE

[**Contracture** = Permanent shortening of the muscle due to fibrosis]

DEFINITION

Massive infarction of the muscles of forearm (flexor compartment) in case of supra-condylar fracture humerus from injury of brachial artery.

N.B.: Similar condition can occur in leg flexors after popliteal artery injury with supra-condylar fracture femur.



INCIDENCE

It is most often seen after supra-condylar fracture (humerus & femur)

CLINICAL PICTURE

Early Picture of acute ischemia of forearm & hand (6Ps)

Pain, Pallor, Paralysis, Paraesthesia, Pulselessness & Perishing coldness.

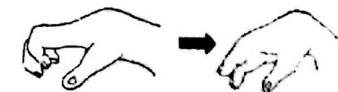
Later on

- ① **Deformity** : Flexion of wrist & inter-phalangeal joints & extension of metacarpophalangeal joints.
- ② **Atrophy** of forearm muscles.
- ③ **Ischemic neuritis & trophic changes** at distribution of median nerve.



N.B. : Special test :

The flexors of fingers are short so when the wrist is flexed, the fingers can be passively extended



TREATMENT

A- Prophylactic ttt

Fracture around elbow must be reduced early to relieve any pressure on the brachial artery. but if signs of acute ischemia occurs do exploration + repair of brachial artery injury

B- In established cases

- Early cases :

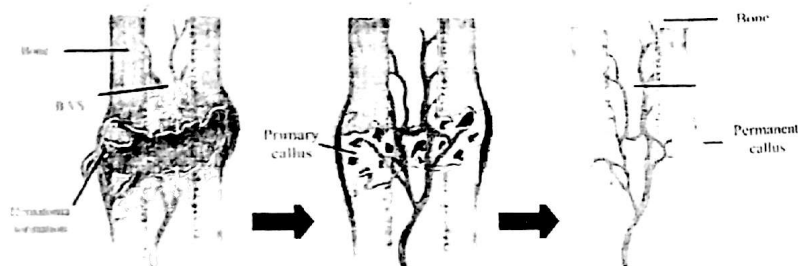
Do passive traction of the shortened muscles in the hyper-extended position by plaster cast.

- Late cases : [Muscle sliding operation]

Sliding the origin of flexor muscles from the medial epicondyle downwards to the ulna. So extra-length is given to the shortened muscles correcting the shape but not the function of the hand

4- MAL, DELAYED & NON UNION

STAGES OF UNION



1- STAGE OF HEMATOMA :

A hematoma forms between & around the fracture surfaces.

2- STAGE OF GRANULATION TISSUE :

The hematoma becomes invaded by fine capillaries & fibroblasts forming granulation tissue.

3- STAGES OF 1st CALLUS FORMATION :

Calcification & invasion by osteoblasts lead to osteoid tissue formation. The 1st callus is found as →

- ⇒ Outer callus.
- ⇒ Inner callus, obliterating the medulla.
- ⇒ Intermediate callus (the most important).

4- STAGE OF CONSOLIDATION : 1st callus is transformed into bone.

5- STAGE OF REMODELING : Absorption of outer & inner cells.

FACTORS AFFECTING UNION OF FRACTURE

A- General (Age of patient)

- ① Children have rapid healing.
- ② Elderly have retarded healing.

B- Local

- ① **Vascularity of fragments :**
e.g. Intra-capsular fracture of neck femur with injury of the blood supply leads to avascular necrosis of femoral head.
- ② **Good immobilization or not.**
- ③ **Position of fragments.**
- ④ **Aseptic fracture leads to good union.**
- ⑤ **Local bone health** i.e. no pathological fractures



TYPES

A- Mal-union

DEFINITION It means union with some deformity i.e. **bad position**.

CAUSES Improper reduction or **bad immobilization**.

CLINICAL PICTURE No pain is associated.

X-RAY Union in **bad position**.

TREATMENT Corrective osteotomy.

B- Delayed union & non union

	DELAYED UNION	NON UNION
DEFINITION	It means union at a slow rate with good position.	It means that fracture did not & will not unite .
CAUSES	A- General Senility, scurvy, debilitating disease, rickets, osteomalacia B- Local ① Impairment of blood supply of one or more fragments. ② Inadequate Immobilization. ③ Interposition of soft tissue between fragments. ④ Infection. ⑤ Local bone disease.	
C/P	There is still abnormal movement & tenderness at the site of fracture.	
X-RAY	Bone ends are still raw & gap is filled with faint bone	Bone ends are sclerosed & gap is seen with no bone
TREATMENT	Prolong the immobilization, e.g. # Clavicle & Colle's #	Internal fixation & application of autogenous bone graft e.g. Iliac crest (bone chips)

Treatment of fractures

A- General management (1ST AID TRETMENT)

- 1- Sterile dressing over the wound.
- 2- Anti-shock measures & analgesics.
- 3- Immobilize the fractured part without reduction.
- 4- Sedation for the patient e.g. **Morphia**.
- 5- Full examination to exclude other injuries.

B- Local management (DEFINITIVE TTT)

- 1-Reduction
- 2- Fixation
- 3-Rehabilitation & physiotherapy



I. REDUCTION

(Aiming at restoring the continuity of the fracture)

A- Closed reduction

- By traction, counter-traction & manipulation until reaching the anatomical position (under anesthesia)
- Confirm the position clinically & by x-ray.

B- Open Reduction (At operation)

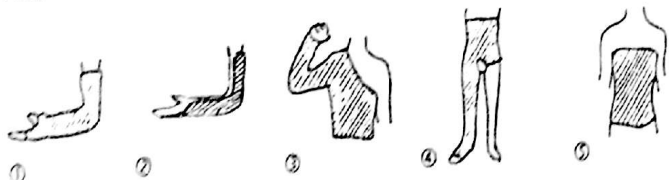
- By exposure of fracture site & apposition of the fractured segments surgically
- Indicated if
 - ① Failure of closed method
 - ② Inter-position of soft tissues between the fracture wound.
 - ③ Intra-articular fractures
- ④ When internal fixation is indicated
 - a- Associated soft tissue injury.
 - b- Pathological fractures
 - c- Fracture dislocation.
 - d- Multiple fractures.
 - e- Unstable fractures.

II. FIXATION

(Aiming at maintaining the reduced position & preventing displacement)

A- External fixation

TYPES



- 1- **Cast** : Circumferential plaster in a limb (plaster cast on paris)
- 2- **Slab** : Plaster put from one side only
- 3- **Shoulder spica** : Cast including trunk & upper Limb.
- 4- **Hip spica** : Cast including trunk & lower limb.
- 5- **Jacket** : Plaster around trunk without limb.

COMPLICATIONS OF CAST

- 1- If tight leads to compression on vessels e.g. Volkmann's contractures.
- 2- If loose leads to mal-union or delayed union
- 3- Pressure on muscles leads to atrophy or joint stiffness.

B- Internal fixation

TYPES



- 1- **Wires** : By stainless steel wire e.g. fracture olecranon or patella
- 2- **Screw** : e.g. oblique fracture of the tibia
- 3- **Plate & screws** : e.g. any transverse fracture
- 4- **Nail (intra-medullary)** : e.g. shaft of femur.
- 5- **Bone graft (Autogenous)** as
 - a upper 2/3 of fibula
 - b Ant. border of tibia.
 - c Iliac crest (bone chips)
 - d Rib (ideal for the mandible)

COMPLICATIONS

- 1- Introduction of infection
- 2- Interfere with union if too much periosteum is tripped.
- 3- Mechanical block of near by joint.
- 4- Improper fixation of the fracture.

C- Fixation by continuous traction

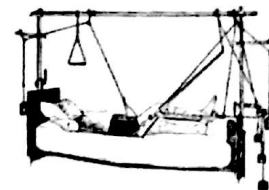
1- SKIN TRACTION

- e.g. **Thomas splint**
- Adhesive tapes are stuck on either side of the limb and held by bandage & cord is tied at the end of the tape for traction.



2- SKELETAL TRACTION

- e.g. **Bohler frame**
- By a special pin introduced transversely at upper end of tibia.



D- External skeletal fixation

- It is indicated with severe compound fracture especially tibia & femur.
- The idea to transfix the major proximal & distal fragment with multiple pins to which is attached a frame device outside the body.



III. REHABILITATION

(Aiming at preserving & restoring the function of injured part)

1- Static (isometric) exercises

They are done for muscles **inside** the cast.

2- Active exercises

They are done for muscles **outside** the cast

Summary for any fractures

1- Aetiology

- Traumatic (Direct, indirect or avulsion)

2- Classifications

- Complete or incomplete.
- Simple or compound
- Shape.

3- Clinical picture

- 1- History of trauma.
- 2- Ecchymosis.
- 3- Loss of function
- 4- Pain
- 5- Swelling
- 6- Deformity
- 7- Abnormal mobility & crepitus.
- 8- Tenderness

4- Diagnosis X-ray

5- Complications

- General (7) with # femur, pelvis & spine only
- Local (7) with all fractures.

6- Management

A- General management (1st aid treatment)
with # femur, pelvis & spine only.

B- Local management (Definitive ttt) — {
1-Reduction
2- Fixation
3-Rehabilitation & physiotherapy

Injuries of Upper limb

INJURIES OF UPPER LIMB

I- FRACTURE CLAVICLE

1- Fracture middle 1/3 80 %

AETIOLOGY (Trauma)

Direct Like hit by a stick.

Indirect Fall on out-stretched hand.

N.B.: The commonest site for fracture is middle 1/3 because

- ① It is the site of meeting of 2 curves.
- ② It is the thinnest part of the bone.
- ③ The site of insertion of subclavius muscle.
- ④ The site of entrance of nutrient artery.

CLASSIFICATION

In children the fracture is often the **greenstick** variety.

CLINICAL PICTURE & DIAGNOSIS As general +

- LOSS OF FUNCTION :

The patient comes carrying the injured limb by the healthy one like a **mother suckling her baby**.

- DEFORMITY :

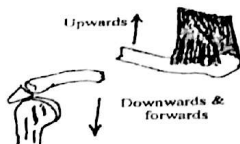
The **medial end** is pulled upwards by the sternomastoid, while the **lateral end** fall downwards by its weight & pulled forwards by the pectoralis major muscle

COMPLICATIONS (Local)

- 1- **SKIN INJURY** with compound fracture.
- 2- **MUSCLE & TENDON** : Tear of **subclavius** muscle.
- 3- **VASCULAR INJURY** of subclavian vessels.
- 4- **NERVE INJURY** of Brachial plexus.
- 5- **BONE COMPLICATIONS** : Mal-union is very common & non-union is rare.
- 6- **JOINT INJURY** : Stiffness of shoulder joint with elderly.
- 7- **VISCERAL INJURY** : To the dome of the pleura & apex of the lung leading to pneumothorax.

TREATMENT

No attempt should be made to reduce the fracture because it is not possible hold the reduction even if it is achieved.



Most surgeon depend only on arm to neck sling for 3 weeks + analgesics.

N.B. : Open reduction is indicated only with Unstable fracture or if vascular, nervous or pleural complications.



2- Fracture outer 1/3 15 %

➤ Usually **no displacement** occurs because both fragments are attached to the scapula by ligaments.

➤ If there is **no displacement**, no treatment is required but analgesics

3- Fracture Inner 1/3 5 %

II- SHOULDER JOINT DISLOCATION

1- Anterior dislocation

AETIOLOGY (Trauma)

Direct

- ① Fall from a height with a limb holding a bar.
- ② Forcible extension of arm.
- ③ Forcible external rotation of arm.

Indirect

Fall on out-stretched hand.

N.B.: Causes of instability of the shoulder joint

- ① Big head of humerus.
- ② Shallow glenoid cavity.
- ③ Wide range of movement.
- ④ Lax capsule especially below.
- ⑤ Lack of muscle support below.



CLINICAL PICTURE As general +

- LOSS OF FUNCTION :

The shoulder cannot be moved & the arm is held in a position of slight abduction.

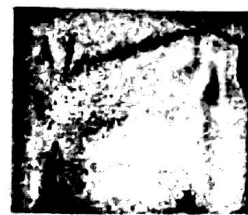
- SWELLING :

The head is felt in abnormal position.

- ① Sub-coracoid (the commonest).
- ② Sub-glenoid.
- ③ Sub-clavicular.

- DEFORMITY :

Flattening of the shoulder contour as the head of humerus is lost with slight abduction.



DIAGNOSIS (X-ray)

Antero-posterior view is diagnostic

COMPLICATIONS (Local)

1- **SKIN INJURY** with associated compound fracture.

2- **MUSCLE & TENDON** : Avulsion of **supra-spinatus tendon**. so the patient is unable to initiate abduction.

3- **VASCULAR INJURY** of axillary vessels.

4- **NERVE INJURY** of brachial plexus.

5- **BONE COMPLICATIONS** : Fracture of head or neck of the humerus.

6- **JOINT INJURY : RECURRENCE** →

⇒ It is due to detachment of the labrum glenoid & the anterior capsule from the anterior margin of the glenoid. A pouch is formed into which the humeral head slips easily

⇒ **Clinically** : - Redislocation occurs with relatively minor every day actions such as combing the hair or during swimming.
- But reduction is equally easy & usually the patient can reduce it by himself.

⇒ **Treatment** :

A. Putti-Platt operation :

The idea is to limit external rotation of the shoulder by shortening of the subscapularis by overlapping.

B. Bankart operation : (The better)

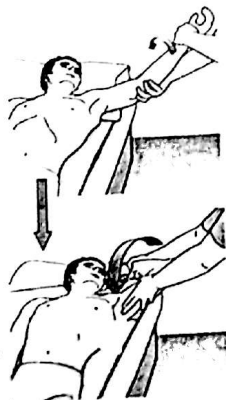
The original lesion in the capsule or labrum glenoid is repaired.



TREATMENT

(**Kocher's operation**)

- Under **general anesthesia**. 1st. externally rotates the arm to relax the subscapularis while pulling down on the arm to dislodge the head
- Then the limb is adducted & internally rotated till the hand of the patient touches the healthy shoulder
- Finally : Fixation in **arm to chest bandage** for 3 weeks.



2- Posterior dislocation

⇒ This is **not common**.

⇒ It is usually caused by **forced internal rotation** of abducted arm.

⇒ It always be suspected after **epileptic fit** or an **exposure to electric shock**.

III. FRACTURE HUMERUS

1- Fractures of the proximal humerus

AETIOLOGY (Trauma)

Direct Less common.

Indirect Fall on out-stretched hand.

CLASSIFICATION (Neer's 4 segments)

Fractures can occur between

- ① Articular segment of fractures.
- ② Greater tuberosity.
- ③ Lesser tuberosity.
- ④ Surgical neck.



Identify each one according to

- ① **One part fracture** → **No displacement**
- ② **Two parts fracture** → **One segment is displaced.**
- ③ **Three parts fracture** → **Two segments is displaced.**
- ④ **Four parts fracture** → **Three segments is displaced.**

CLINICAL PICTURE & DIAGNOSIS As general

COMPLICATIONS (Local)

As general + Circumflex nerve injury → paralysis of deltoid muscle .

TREATMENT

1- One part fractures :

- External immobilization using a sling until pain subsided.

2- Two parts fractures :

- **Fractures of greater tuberosity** :
Open reduction & internal fixation using **screw or wire**
- **Fractures of lesser tuberosity** :
Just immobilization using **arm to neck sling** for 3 weeks
- **Fractures of surgical neck** :
Closed reduction & **arm to neck sling** for 3 weeks

3- Three parts fractures :

- Open reduction & internal fixation

4- Four parts fractures :

- Usually associated with avascular necrosis of the humeral head & best treated by **prosthetic replacement**.



2- Fracture of the shaft of humerus

AETIOLOGY (Trauma)

Direct Blow over the shaft.

Indirect Fall on me out stretched hand.

CLINICAL PICTURE & DIAGNOSIS As general +

- **DEFORMITY** : It may be

1- ABDUCTION TYPE

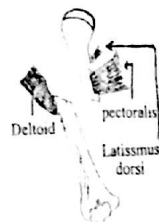
- Fracture **above** insertion of deltoid.

- **Proximal segment** :

Adducted by the pectoralis & latissimus dorsi.

- **Distal segment** :

Adducted by deltoid.



2- ADDUCTION TYPE

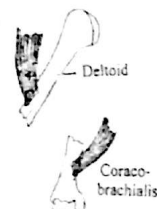
- Fracture **below** insertion of deltoid.

- **Proximal segment** :

Adducted by deltoid.

- **Distal segment** :

Adducted & pulled upwards by coraco-brachialis.



COMPLICATIONS (Local) As general +

- **Radial nerve injury**.

- **Non union** because fracture in middle 1/3 leads to injury of nutrient artery.



TREATMENT

Closed reduction + external fixation

- **Reduction** : with gentle traction on the elbow.

- **Fixation** : U- shaped plaster slab for 3 weeks to be changed by collar & cuff sling for 3 weeks.

Open reduction + internal fixation by plate & screws



3- Supra-condylar fracture humerus

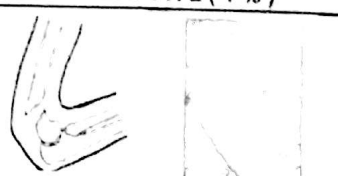
AETIOLOGY (Trauma) frequent in CHILDREN

Direct very rare.

Indirect Fall on me out stretched hand.

CLINICAL PICTURE & DIAGNOSIS As general +

- **DEFORMITY** : It may be

EXTENSION TYPE (99 %)	FLEXION TYPE (1 %)
	
Displaced backwards & upwards, i.e. extended in relation to proximal fragment.	Displaced forwards & upwards i.e. Flexed in relation to proximal segment.

D.D POSTERIOR DISLOCATION OF THE ELBOW JOINT

	SUPRA-CONDYLAR FRACTURE	POSTERIOR DISLOCATION
		
- Age	Commonly in children .	Commonly in adults
- Anterior palpation	Lower border of upper fragment is felt above the elbow crease.	Lower border of the humerus is felt, at the level of the elbow crease
- Posterior palpation	Upper border of lower fragment is felt sharp	The olecranon is felt
- Measurements: tip of acromion to lateral epicondyle	Short	Normal

COMPLICATIONS (Local)

1- **SKIN INJURY** with associated compound fracture

2- **MUSCLES** : Myositis ossificans at brachialis muscle.

3- **NERVE INJURY** : Median, radial or ulnar nerve injuries

4- VASCULAR INJURIES : Volkmann's ischemic contracture.



5- **JOINT** : Stiffness of the elbow.

6- **BONE** : Malunion from failure to reduce the fracture properly.

N.B. : Cubitus varus or valgus :

It means loss of carrying angle → delayed ulnar neuritis

TREATMENT

Closed reduction + external fixation + after care

- Reduction :

Urgent to relieve brachial vessels from any compression (under general anesthesia) the elbow is extended while the lower fragment is guided **forwards** in extension type or **backwards** in flexion type.

Then the carrying angle is checked with elbow fully extended & the forearm fully supinated by comparison with the angle of normal side.

Then the elbow slowly flexed until 90° is reached

Throughout this maneuver : The radial pulse is felt

- Fixation :

Above elbow posterior slab for 3 weeks then a collar & cuff is added.

N.B.: Some surgeons prefer to fix this fracture with the elbow in extension

① To avoid compression of the vessels & elbow stiffness.

② To prevent cubitus varus deformity



- After care

Hospitalization & monitoring of radial pulse for 48 hours.

Open reduction + internal fixation by wires

Indicated when the closed method fails to obtain satisfactory reduction

IV- ELBOW JOINT DISLOCATION

POSTERIOR DISLOCATION	ANTERIOR DISLOCATION
Coronoid	Olecranon
Fracture of coronoid process of ulna is associated	Fracture of olecranon process of ulna is associated
(Trauma) frequent in ADULT Fall on outstretched hand while the limb is extended.	
Fall on tip of elbow,	

AETIOLOGY

CLINICAL PICTURE & DIAGNOSIS As general +

- DEFORMITY :

The olecranon is felt (abnormally) posterior to the humeral condyles with post. dislocation

N.B.: Disturbance in the triangular relation of 3 bony land-marks. (2 Epicondyles & 1 olecranon).



COMPLICATIONS As general +

TREATMENT

Closed reduction + external fixation

- **Reduction** : Under general anesthesia traction is applied in the long axis of the slightly flexed ulna.

- **Fixation** : Above elbow posterior slab for 3 weeks to allow for healing of the capsule & the ligaments

Open reduction + internal fixation Rarely done

V- FRACTURE OF THE FOREARM

1- Fractures of the head of the radius

2- Fractures of the shafts of radius & ulna

3- Monteggia fracture-dislocation

4- Galeazzi fracture-dislocation

5- Colle's' fracture

1- Fractures of the head of the radius

AETIOLOGY (Trauma)

Direct very rare.

Indirect Fall on the outstretched hand.

TYPE 1- **Fissure** 2- **Sector** 3- **Comminuted**

CLINICAL PICTURE & DIAGNOSIS As general +

Supination, pronation & elbow movement is limited.

TREATMENT

Fissure or sector A sling till pain decreases

Comminuted Excision of head of radius.



2- Monteggia fracture

⇒ It consists of fracture of the upper 1/3 ulna & dislocation of superior radio-ulnar joint.

3- Galeazzi fracture

⇒ It consists of fracture of the lower 1/3 radius & dislocation of inferior radio-ulnar joint

4- Fracture of shaft of radius & ulna

AETIOLOGY (Trauma)

- **Fracture one bone** : Direct trauma only.

- **Fracture both bones** :

- **Direct** : Blow will break the bones at same level.
- **Indirect** : Results in oblique fractures at different level

CLINICAL PICTURE & DIAGNOSIS As general

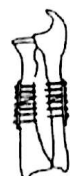
COMPLICATIONS As general +

Cross union (between radius & ulna) if fracture at same level

TREATMENT

A- **Undisplaced fractures**
Above elbow cast 6 weeks.

B- **Displaced fractures**
Opened reduction
+ internal fixation
by plate & screws →



5- Colle's fracture

DEFINITION

Fracture of the distal inch of the radius

TYPE OF PATIENT

Old female due to post-menopausal osteoporosis.

AETIOLOGY (Trauma)

Direct very rare.

Indirect Fall on the outstretched hand.

N.B.: Smith's fracture (Reversed colle's)

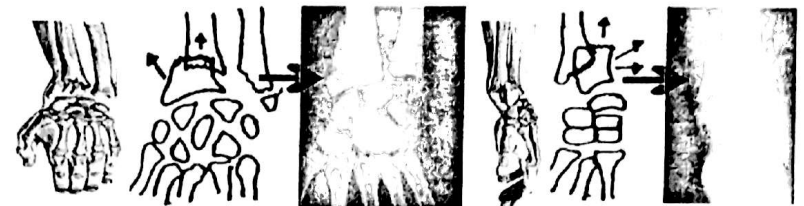
- This is the reverse of colle's fracture.
- It is due to fall on the dorsum of the wrist.

CLINICAL PICTURE As general +

- **DEFORMITY** : Typical **dinner fork** deformity

The distal segment displaced upwards, backwards & laterally.
The fracture is commonly comminuted & impacted.

DIAGNOSIS (X-ray) Antero-posterior & lateral views is diagnostic



COMPLICATIONS (Local)

1- **SKIN INJURY** with associated compound fracture.

2- **MUSCLE & TENDON** : Tear of **extensor pollicis longus** muscle

3- **VASCULAR INJURY** of radial or ulnar artery.

4- **NERVE INJURY** : Median nerve injury or **carpal tunnel syndrome** which is a late complication & treated by surgical division of flexor retinaculum

5- **BONE COMPLICATIONS** : Mal-union because of displacement inside the plaster

6- **JOINT INJURY** : Stiffness of wrist & fingers.

7- **Sudek's atrophy** (See page 98).

N.B: Made-lung deformity

- It occurs in **young patient** where there is arrest of growth of the radius.
- The wrist & hand will **deviate** to the radial side.
- **Excision** of lower end of ulna is needed



TREATMENT

Closed reduction + external fixation + after care

- **Reduction** : Under general anesthesia by 3 hand grips method :

1st grip: to correct **upwards** displacement.
by Traction on thumb & finger **downwards**
& counter-traction on forearm.

2nd grip: To correct **backwards** displacement.
by pushing lower fragments **forwards**
& counter-traction on forearm .

3rd grip: To correct **lateral** displacement.
by pushing lower fragments **medially**
& counter-traction on forearm .

- **Fixation** : Below elbow plaster cast for 6 weeks.

- **After care** : The fingers should be actively mobilized
& elevation of arm above head several
times to prevent joint stiffness.



VI- FRACTURE OF THE HAND

Fracture scaphoid

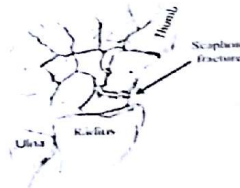
AETIOLOGY (Trauma)

Direct very rare.

Indirect Fall on me out stretched hand.

CLINICAL PICTURE & DIAGNOSIS As general +

Tenderness at anatomical (snuff box).
Usually misdiagnosed as sprain wrist.



COMPLICATIONS As general +

- **BONE** :

- ① Avascular necrosis.
- ② Non-union
because of injury of its blood supply.



TREATMENT

A- If early

The wrist is fixed in **below elbow cast** including the thumb for 6 weeks

B- If late & sclerosed bone

Bone graft between 2 fragments

Injuries of Pelvis & lower limb

INJURIES OF PELVIS & LOWER LIMB

I- FRACTURE PELVIS

AETIOLOGY (Trauma)

Direct Usually results from road traffic accident

Indirect Fall in the home in elderly patients.

CLASSIFICATION

A- Fractures outside the pelvic ring

1- Traction injury e.g. avulsion fractures

TRAUMA Severe muscular contractions

EXAMPLES ① Avulsion of **A.S.I.S** by the sartorius muscle → A.S.I.S

② Avulsion of **A.I.I.S** by the rectus femoris muscle → A.I.I.S

2- Iliac wing

3- Sacrum

4- Coccyx

B- Single fractures of the pelvic ring

TRAUMA Direct blow on the side or front of pelvis.

EXAMPLES ① Fracture **pubic rami**

② Fracture **ischial rami**

C- Lateral wall fracture

1- Acetabular fracture

2- Segmental fracture

D- Double fracture of the pelvic ring

1- Double breaks in the anterior segment :

- The weak anterior segment of the pelvis fractured on both sides of pubic and ischial rami.

- So it is called (**Tetraramic fracture**).

- The detached segment may be pushed backward causing rupture urethra.

2- Combined breaks in both anterior & posterior segments :

1- HINGE SUBLAXATION

- Disruption of the symphysis pubis & disruption of one of sacro-iliac joint (**open book fracture**)



2- VERTICAL SHEAR FRACTURE

- Fracture of both rami at the front & fracture of the ileum posteriorly.



CLINICAL PICTURE & DIAGNOSIS As general +

- LOSS OF FUNCTION :

The patient cannot stand or lifting his legs, but passive movement at the hip can be elicited by the surgeon.

- DEFORMITY :

The leg may be **externally rotated**



COMPLICATIONS

A- General As GENERAL

B- Local

1- **SKIN INJURY** with associated compound fracture

2- **MUSCLE & TENDON** : Tear of corresponding muscles

3- **VASCULAR INJURY** of pelvic vessels

4- **NERVE INJURY** : Sciatic nerve injury

5- **BONE COMPLICATIONS** : Mal-union causing no significant problems except in female (caesarean section may be required for delivery)

6- **JOINT INJURY** : Stiffness & 2nd osteoarthritis

7- **VISCERAL INJURIES** : As urethra, bladder, rectum, vagina ... etc.



TREATMENT

A- Correction of shock & treatment of visceral injury have a priority over treatment of fracture pelvis.

B- Treatment of fracture

1- FRACTURES OUTSIDE THE PELVIC RING

2- SINGLE FRACTURES OF THE PELVIC RING

3- **TETRARAMIC FRACTURE** :
Uncomplicated fracture

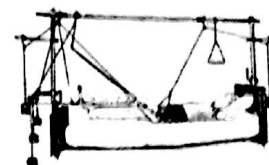
4- HINGE SUBLAXATION :

Open book fracture 1- Closed reduction by a pelvic sling
or 2- Open reduction & internal fixation using a plate & screws

5- VERTICAL SHEAR FRACTURE :

Skeletal traction e.g. Böhler frame

- By a special pin introduced transversely at upper end of tibia.



Require bed rest for 6 weeks

II- HIP JOINT DISLOCATION

1- Posterior dislocation

AETIOLOGY (Trauma)

Direct Car accident while patient is in the front seat.

Indirect Fall of heavy objects on the pelvis of a person leaning forwards with the legs adducted e.g. (mine workers).

N.B.: CAUSES OF STABILITY OF THE HIP JOINT :

- ① The depth of acetabular cavity.
- ② The strong support by its ligament & muscles.



CLINICAL PICTURE As general +

- LOSS OF FUNCTION :

Movement of the hip is painful & limited, there is shortening of the affected limb.

- SWELLING :

The head is felt on abnormal position (gluteal region)

- ① Dorsal dislocation
- ② Iliac dislocation.
- ③ Sciatic dislocation, i.e. in sciatic notch

- DEFORMITY :

The hip is in the position of flexion, adduction & internal rotation



DIAGNOSIS (X-ray)

RADIOLOGICAL FINDINGS :

- ① The femoral head lies outside the acetabulum.
- ② The **Shenton's line** is interrupted.
It is a curve formed by lower margin of the superior pubic ramus & the lower border of femoral neck.
- ③ Any associated fractures.



COMPLICATIONS

A- General As GENERAL

B- Local

- 1- **SKIN INJURY** with associated compound fracture.
- 2- **MUSCLE & TENDON** : Tear of corresponding muscles.
- 3- **VASCULAR INJURY** : Avascular necrosis of femoral head.
- 4- **NERVE INJURY** : Sciatic nerve injury
- 5- **BONE COMPLICATIONS** : Fracture of posterior lip of acetabulum.



TREATMENT

Closed reduction + external fixation

- Reduction : Under general anesthesia

The hip & knee are flexed then do external rotation & abduction.
So reduce the head to its socket

- Fixation Skin traction on Thomas splint for 6 weeks



2- Anterior dislocation



AETIOLOGY (Trauma)

It is due to fall of a heavy object on the upper lateral side of the thigh While the hip is abducted & externally rotated.

CLINICAL PICTURE & DIAGNOSIS As general +

- SWELLING :

Because the head is felt in abnormal position (groin region).

- DEFORMITY :

The hip in the position of flexion, abduction & external rotation



TREATMENT

Closed reduction + external fixation

- Reduction : Under general anesthesia

The thigh is flexed, adducted then internally rotated

- Fixation Hip spica for 6 weeks.



3- Central dislocation



AETIOLOGY (Trauma)

It is actually fracture pelvis. The head of femur passes medially to lay in the pelvis due to fall on the greater trochanter.

CLINICAL PICTURE & DIAGNOSIS As general +

- SWELLING :

The head may be felt by PR or PV.

- DEFORMITY :

Adduction form.



TREATMENT

- **CLOSED & OPEN REDUCTION METHODS** are both difficult & unsatisfactory

- **THE BEST MANGEMENT** is tibial skeletal traction

III- FRACTURE FEMUR

1- Fracture of the neck of femur

A- Intra-capsular fractures

AETIOLOGY (Trauma)

Direct Common in old age due to senile osteoporosis
The trauma may be a trivial twisting injury as when the foot catches the edge of a carpet

Indirect Fall from a height.



CLASSIFICATIONS

1- Sub-capital : Immediately below the head of femur

2- Trans-cervical : Somewhere in the neck of femur

CLINICAL PICTURE & DIAGNOSIS As general +

- SWELLING :

Due to raised greater trochanter

- DEFORMITY :

The hip is adducted & externally rotated.



COMPLICATIONS

A- General As GENERAL +

Special comment on D.V.T as a common complication.

B- Local As GENERAL +

- VASCULAR INJURY : Avascular necrosis of femoral head.
due to cutting of retinacular vessels

- BONE COMPLICATIONS : Non-union (very common)
due to avascular necrosis & senility.



TREATMENT

A- If young patient

Open reduction + internal fixation by **CANNULATED SCREWS**

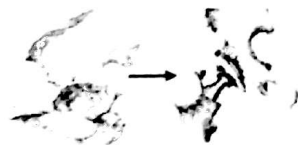
B- If old patient

1- HEMIARTHROPLASTY (Partial hip arthroplasty)

i.e. Replacement of the head of femur by a prosthesis
e.g. Austin-moore or cemented Thompson.

2- TOTAL HIP REPLACEMENT

If associated
osteoarthritis.



B- Extra-capsular fractures

AETIOLOGY (Trauma)

Direct Fall on the side producing a blow over the greater trochanter

Indirect Fall from a height.

CLASSIFICATIONS

1- Trochanteric fractures :

Down to the level of lesser trochanter.

2- Subtrochanteric fractures

From the lesser trochanter to 8 cm below



CLINICAL PICTURE & DIAGNOSIS As general +

- DEFORMITY :

The hip is adducted & externally rotated.

COMPLICATIONS

A- General As GENERAL +

Special comment on D.V.T as a common complication.

B- Local As GENERAL +

- NO Avascular necrosis

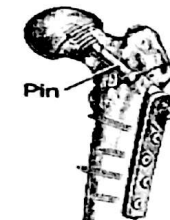
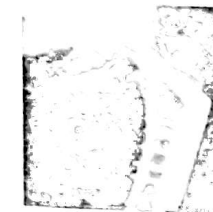
- BONE COMPLICATIONS : Mal-union (very common)



TREATMENT

A- If fit patient

Open reduction + internal fixation by **DYNAMIC HIP SCREW (D.H.S)**

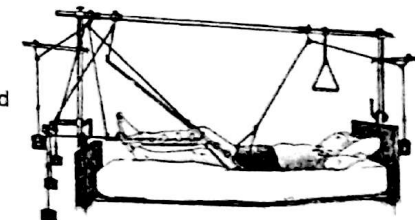


B- If unfit patient

SKELETAL TRACTION

e.g. **BOHLER FRAME**

- By a special pin introduced
transversely at upper end
of tibia.



2- Fracture of the shaft of femur

AETIOLOGY (Trauma)

Direct As motor car accident, birth injury (breech)

Indirect Fall from a height on straight legs

CLINICAL PICTURE & DIAGNOSIS **As general +**

Upper 1/3



Middle 1/3



Lower 1/3



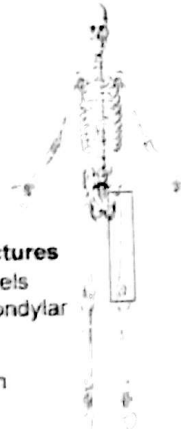
- DEFORMITY	Proximal fragment	Distal fragment
Upper 1/3 fracture	Flexed by iliopsoas, abducted by glutei, externally rotated by obturator externus	Pulled up & adducted by adductors.
Middle 1/3 femur	The powerful thigh muscles cause angulation & overriding	
Lower 1/3 femur = supra-condylar	Pulled forwards by quadriceps	Pulled backwards by gastrocnemius.

COMPLICATIONS

A- General **AS GENERAL**

B- Local

- 1- **SKIN INJURY** with associated compound fracture.
- 2- **MUSCLE & TENDON** : Myositis ossificans of quadriceps femoris.
- 3- **VASCULAR INJURY** : Volkmann's ischemic contractures of the leg flexors popliteal vessels injuries especially with supracondylar fracture.
- 4- **NERVE INJURY** : popliteal nerve injury especially with supra-condylar fracture.
- 5- **BONE COMPLICATIONS** : Mal-union causing shortening.
- 6- **JOINT** : Osteoarthritis of knee joint 2nd to mal-union.



TREATMENT

A- General management (1ST AID TREATMENT)

- 1- Sterile dressing over the wound
- 2- Anti-shock measures & analgesics
- 3- Immobilize the fractured part without reduction
- 4- Sedation for the patient e.g. **Morphia**
- 5- Full examination to exclude other injuries.

B- Treatment of fracture (ACCORDING TO THE AGE)

⇒ **New born**

The fracture is splinted over **tongue depressor** & the limb is bandaged to the abdomen with hip flexion.

⇒ **Children up to 4 years**

BRYANT'S METHOD OVER GALLOW SPLINT

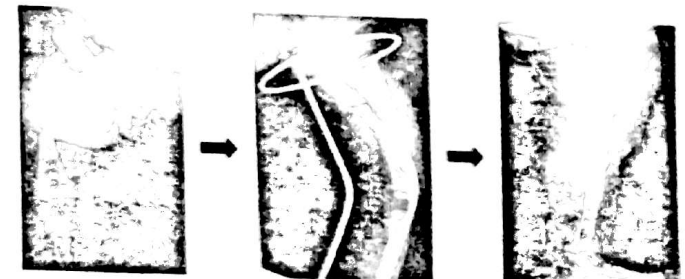
- This is a skin traction applied to the thighs while the hip is flexed 90° & knee extended
- The buttocks are elevated above the head to produce counter-traction and facilitate nursing the bowel.



⇒ **Age between 5-15 years**

SKIN TRACTION ON THOMAS SPLINT

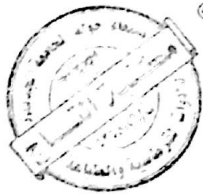
- **Technique** :
 - **Skin traction** through adhesive plaster.
 - **Thomas splint** : The cord is from adhesive plaster are tied to the end of the splint
- **Disadvantages** :
 - ① Complications of prolonged bed rest
 - ② Liability to stiffness of the knee joint
 - ③ Soft tissue interposition → Non union



⇒ **Adult & old age**

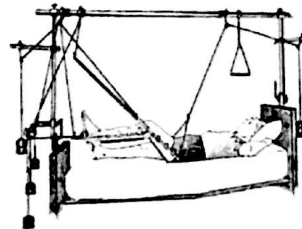
OPEN REDUCTION & INTERNAL FIXATION (Fit patient)

- **Method** by intra-medullary nail or plate & screws.
- **Complications :**
 - ① Introduce infection.
 - ② Mechanical block of near by joint (if nail too long)
 - ③ Improper fixation (if nail too short).
 - ④ If thick nail it may break the bone.



SKELTAL TRACTION ON BOHLER FRAME (Unfit patient)

- **Method** by a special pin introduced transversely at upper end of tibia.
- The **traction** is applied distally by weights.
- The **counter-traction** depends upon the body weight acting by elevating the foot of bed.



N.B.: The best with supra-condylar fracture :

Closed reduction with skeletal traction on Böhler's splint
or Open reduction & internal fixation by plate & screws

IV- FRACTURE PATELLA

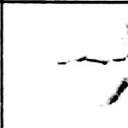
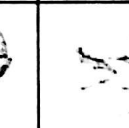
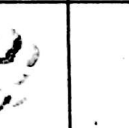
AETIOLOGY (Trauma)

Direct Direct blow to the anterior aspect of the flexed knee.

Indirect Severe muscular contraction of quadriceps muscle
i.e. Avulsion



TYPES

FISSURED FRACTURE	TRANSVERSE FRACTURE	COMMUNUTED FRACTURE	STAR SHAPED FRACTURE
			

CLINICAL PICTURE As general +

- **SWELLING :**
Due to hemoarthrosis of knee joint
- **DEFORMITY :**
Fingers can be dipped in transverse fracture.



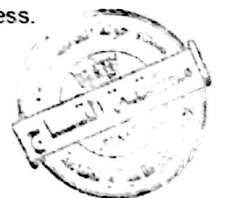
DIAGNOSIS (X-ray)

COMPLICATIONS (Local) As general +

- 1- **SKIN INJURY** with associated compound fracture.
- 2- **MUSCLE & TENDON :** Tear of quadriceps expansion causing loss of extension.
- 3- **BONE COMPLICATIONS : Non-union**
because of ① Distraction of the 2 fragments.
② Soft tissue interposition.
- 4- **JOINT INJURY :** Hemoarthrosis of knee joint & stiffness.

TREATMENT

- A- If fissure fracture
Elastic bandage + knee splint for (3 weeks)
- B- If transverse fracture
Fixation by wire & screws or partial pateleectomy.
- C- If comminuted fracture
Total pateleectomy.



V. FRACTURE TIBIA & FIBULA

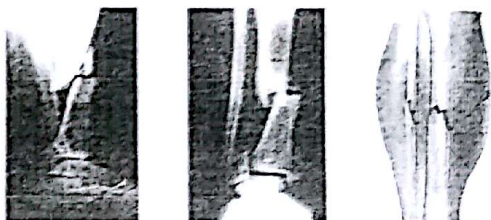
AETIOLOGY (Trauma)

- Fracture one bone : Direct trauma only
- Fracture both bones :
 - Direct : Blow will break the bones at same level.
 - Indirect : Results in oblique fractures at different level



CLINICAL PICTURE As general

DIAGNOSIS (X-rays)



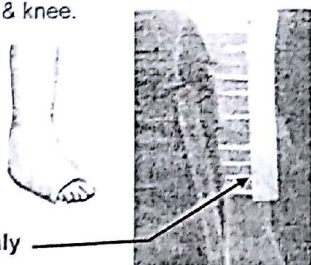
COMPLICATIONS (Local) As general +

- 1- SKIN INJURY with associated compound fracture.
- 2- VASCULAR INJURY of popliteal artery in fracture proximal tibia.
- 3- BONE COMPLICATIONS : Cross union (between radius & ulna) if fracture at same level
- 4- JOINT INJURY : Stiffness of ankle & knee.

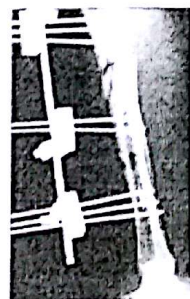
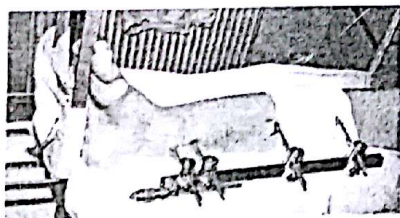
TREATMENT

A- Undisplaced fractures
Above knee cast 6 weeks.

B- Displaced fractures
Opened reduction
+ internal fixation
by plate & screws of tibia only



N.B.: We use external fixator
if comminuted fracture.



VI- DISLOCATION OF THE ANKLE

Pott's fracture



AETIOLOGY (Trauma)

Classified according to mechanism of injury %

	Stage I	Stage II	Stage III
1.External rotation			
2.Abduction injury			
3.Adduction injury			
4.Vertical compression injury			

	External Rotation	Abduction injury	Adduction injury	Vertical compression
Stage I	Spiral # of lateral maleolus	Transverse # of medial maleolus or tear of deltoid ligament.	Transverse # of lateral maleolus or tear of lateral ligament	Fall from a height → neutral position → burst # ankle.
Stage II	Stage I + # of medial maleolus or tear of deltoid ligament with lateral dislocation talus.	Stage I + # of lateral maleolus with lateral dislocation talus.	Stage I + # of medial maleolus with medial dislocation talus.	Fall on dorsi flexion, leads to anterior marginal # tibia
Stage III	Stage 2 + # of posterior margin tibia & postero-lateral dislocation talus.	Stage 2 + # of posterior margin tibia & postero-lateral dislocation talus.	Stage 2 + # of posterior margin tibia & postero-medial dislocation talus.	Fall on plantar flexion leads to posterior marginal # tibia

CLINICAL PICTURE & DIAGNOSIS As general +

- DEFORMITY :

depends on the stage

DIAGNOSIS (X-rays)



COMPLICATIONS (Local) As general +

1- BONE COMPLICATIONS : Mal-union or non union

2- JOINT INJURY : Osteoarthritis & stiffness of ankle joint

3- Sudek's atrophy (See page 98).

TREATMENT

A- Fracture one malleolus without displacement

Below knee cast for 6 weeks.



B- Displaced pott's fracture

Open reduction + internal fixation
by screws



C- Physiotherapy

To prevent ankle stiffness

Injuries of spine

THE SPINE & SPINAL CORD

I- CONGENITAL ANOMALY

Spina bifida

DEFINITION

Congenital absence of posterior neural arch of the vertebrae

SITE Most common at lumbo-sacral

TYPES

I- Spinal bifida occulta (10 %)

The defect in spine & lamina only, there is dimpling in the skin over it with tuft of hair & dilated veins.

II- Spina bifida manifesta (90 %)

1- Meningocele :

- **Definition** : Protrusion of meninges through lumbar defect.
- **C/P** : No paralytic lesion & hydrocephalus is common.
- **Diagnosis** : Cystic translucent mass.

2- Meningomyelocele :

- **Definition** : Protrusion of meninges & cord through lumbar defect.
- **C/P** : Paralytic lesion & hydrocephalus is rare.
- **Diagnosis** : Cystic transopaque mass.

3- Myelocele

4- Syringomyelocele

} Very rare

DIAGNOSIS (X-ray)

TREATMENT

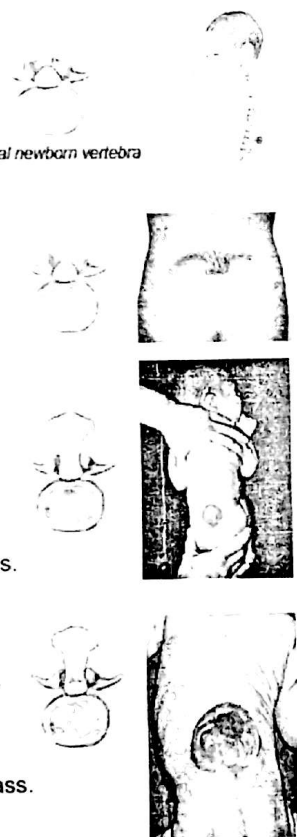
1. Excision with repair of the defect

To avoid rupture of meningitis.

2. Shunt operations

If hydrocephalus is developed.

Normal newborn vertebra



II- FRACTURE OF THE SPINE

Thoraco-lumbar spine injury

	Stable		Unstable
	Wedge compression	Comminuted fracture	Fracture dislocation
Trauma	Flexion injury e.g. fall of a heavy object on the bent of the back	Vertical compression as fall from a height	Flexion-rotation forces → rupture of posterior ligament → dislocation.
Pathology	- Front of the vertebral body is compressed - Intact posterior ligament. - Rare spinal cord injury	- Body of the vertebra is broken. - Intact posterior ligament. - Rare spinal cord injury	- Lateral & forward displacement of the vertebral body - Rupture posterior ligament. - Damage of spinal cord
C/P As general +	Mild symptoms with localized tenderness	Marked symptoms than wedge fracture	Severe symptoms & shock "Neurogenic"
Diagnosis	Plain x-ray, CT scan & MRI more accurate in diagnosis.		

COMPLICATIONS

A- General AS GENERAL +

- **Shock** : Neurogenic
- **Paralytic ileus & acute gastric dilatation**
due to $\rightarrow$
 - 1- Retro-peritoneal hematoma.
 - 2- Sympathetic over-stimulation.
- **Complications of prolonged recumbancy**
 - ① Bed sores.
 - ② D.V.T.
 - ③ Respiratory complications.
 - ④ Pulmonary embolism.
 - ⑤ Urinary calculi.
 - ⑥ Constipation.
 - ⑦ Psychological complications.

B- Local AS GENERAL

+ Traumatic paraplegia

TREATMENT

A- General management (1ST AID TRETMENT)

- 1- **Sterile dressing** over the wound.
- 2- **Anti-shock** measures & analgesics.
- 3- **Immobilize** the fractured part without reduction.
- 4- **Sedation** for the patient e.g. **Morphia**.
- 5- **Full examination** to exclude other injuries.

B- Treatment of fracture

A- WEDGE COMPRESSION :

Rest in bed on **firm mattress** till pain subsides
+ Active exercise for back muscles + pain killers.

B. COMMINUTED FRACTURE :

Plaster jacket in a straight position for 3 month

C. UNSTABLE FRACTURE DISLOCATION :

Open reduction & internal fixation
by plate & screws then plaster jacket

N.B.: Traumatic paraplegia

Should be written from neurology in details
as a complication of fracture spine
+ the care of paraplegia

III- INFLAMMATION OF THE SPINE

T.B of the spine

Pott's disease



INCIDENCE

- **Age** : Any age (75 % < 10 years).
- **Sex** : Equal sex.

AETIOLOGY

- **Organism** : Human or bovine T.B.
- **Route of infection** : Blood borne 2nd to 1st T.B elsewhere

PATHOLOGY

- The disease usually affects 2 or 3 adjoining vertebrae with destruction of intervertebral disc.
- The disease may short as $\rightarrow$

1- INTRA-OSSEOUS (Central type)

T.B osteomyelitis of children $\rightarrow$ collapse of vertebrae
 $\rightarrow$ angular deformity kyphosis.



2- PERIOSTEAL (Peripheral type)

T.B periosteitis of adult $\rightarrow$ para-vertebral abscess
 $\rightarrow$ compression of the cord $\rightarrow$ paraplegia.



CLINICAL PICTURE

A- General T.B toxemia

B- Local

- 1- **PAIN** : Local dull aching at site of the disease & $\uparrow$ with movement
- 2- **LOCALIZED TENDERNESS** : Can be elicited by percussion over the affected vertebrae
- 3- **RIGIDITY & LIMITATION OF SPINAL MOVEMENTS :**
 - ① Rigidity is elicited by lifting the patient from his feet while in the prone position $\rightarrow$ **No** concavity of the spine.
 - ② Limitation of movements(**Coin test**)
To get a coin from the ground the patient has to flex his knees instead of flexion of the spine.

COMPLICATIONS

1- Cold abscess :

At 1st it collects under the anterior longitudinal ligament then trickle along various anatomical planes to appear at sites far from the site of original pathology

- CERVICAL REGION

- ① Retropharyngeal abscess.
- ② Posterior triangle of the neck.

- THORACIC REGION

- ① Mediastinal abscess
- ② Empyema of pleura

- LUMBAR REGION

- ① Psoas abscess (In psoas sheath).
- ② Iliac abscess (In iliac sheath).

2- Paraplegia : 10 %

A- Early due to

- ① Pressure by a cold abscess on the cord.
- ② Pressure by sequestered piece of bone.
- ③ T.B meningitis or T.B. myelitis.

B- Late due to angular kyphosis.

3- Deformity : Angular kyphosis



INVESTIGATIONS

- 1- E S R, Tuberculin test, chest x-ray.
- 2- Bacteriological examination of aspirated pus.
- 3- X-ray spine shows
 - ① 2 or more vertebrae are affected.
 - ② Intervertebral disc space is lost.
 - ③ Soft tissue shadow of abscess



TREATMENT

A- Conservative treatment

(uncomplicated pott's disease)

- 1- Anti-tuberculous drugs for 9 months
- 2- Rest & good nutrition
- 3- Spine support by plaster jacket



B- Surgical treatment

(Complicated pott's disease)

1- COLD ABSCESS

A- If accessible : e.g. posterior triangle. **Aspiration** is done

B- If not accessible : **Costo-transversectomy**
i.e. excision of transverse process
& part of the rib then aspiration.



2- PARAPLEGIA

A- Reversible paraplegia :

Evacuation of cold abscess through antero-lateral decompression. It is an extension of **costo-transversectomy** with removal of **pedicle & lateral part** of the body of the vertebra.



B- Irreversible paraplegia

Conservative & nursing measures
i.e. care of bladder & bowel.

3- KYPHOSIS Physiotherapy

IV- LUMBAR DISC PROLAPSE

AETIOLOGY

- 1- **TRAUMA** : Lifting heavy objects or excessive exercise
- 2- **CONGENITAL** : Weakness of supportive ligaments of the spine produces extra-strain on the disc.

PATHOLOGY

Site Disc between L₄ - L₅ or L₅ - S₁

Stages

1ST STAGE :

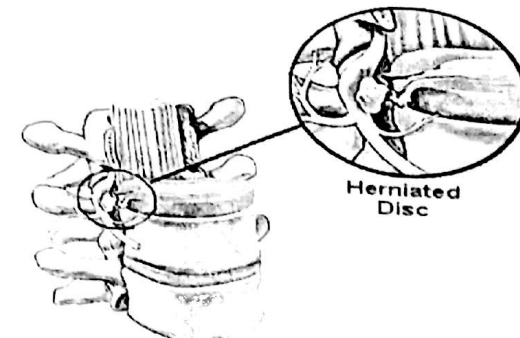
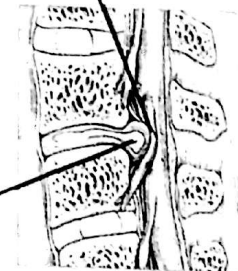
Softening & fragmentation of the posterior part of **annulus fibrosus**

2ND STAGE :

Prolapsed material (**nucleus pulposus**) presses on the roots leading to sciatica or cauda equina.

3RD STAGES :

Prolapsed material becomes fibrotic with more injury to spinal cord.



CLINICAL PICTURE

History Sudden strain followed by low back pain

Symptoms

- 1- Limping gait & lumbar scoliosis.
- 2- Sciatic pain : pain referred down to one or both leg

Signs

- 1- Flexion of the spine or raising straight leg → 11 pain.
- 2- Sensory changes : 1st parathesia then sensory loss
- 3- Motor changes : wasting or paralysis.

D.D From **SPINAL TUMORS**
or **POTT'S DISEASE** of spine.

INVESTIGATIONS

MR! or **MYLOGRAPHY**

TREATMENT

A- Conservative treatment

Rest in bed, analgesics,
anti-rheumatics & physiotherapy.

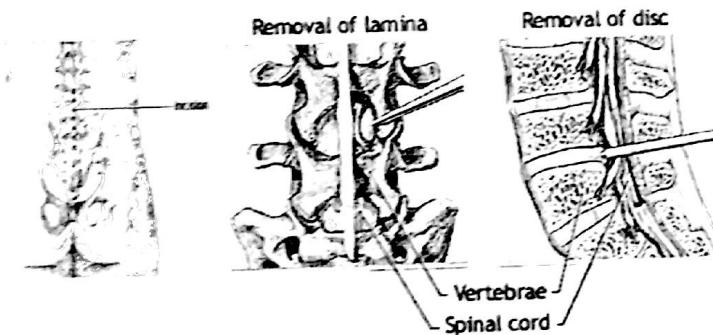
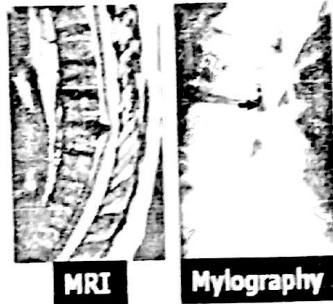
B. Epi-dural injection

Injection of **Novocain** & **Corticosteroids** may relief pain.

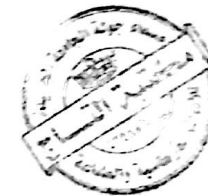
C. Surgical treatment

1- LAMINECTOMY : Open surgery or endoscopic
i.e. removal of prolapsed disc.

2- SPINAL FIXATION BY PLATE & SCREWS
If multiple level discs to be removed



Bone deformities



BONE DEFORMITIES

I- DEFORMITIES OF UPPER LIMB

1- Deformities of the elbow

Normally the forearm is in a position of slight abduction with the arm constituting an angle of about 10° - 15° known as the carrying angle.

1- Cubitus valgus

- In **cubitus valgus**, this angle is **increased** so that the hand deviates away from the body.
- The **most common cause** is non-union of a supra-condylar fracture of humerus, it leads to delayed ulnar neuritis.
- The deformity itself needs **no treatment** but for delayed ulnar palsy, the nerve transported to the front of the elbow.

2- Cubitus varus

- In **cubitus varus**, this angle is **decreased** so that the hand deviates towards the body.
- The most common cause is mal-union of a supra-condylar fracture of the humerus.
- The deformity can be corrected by a **wedge osteotomy**

2- Deformities of the wrist & hand

1- Made-lung deformity

- It occurs in **young patient** where there is arrest of growth of the radius.
- The wrist & hand will **deviate** to the radial side.
- **Excision** of lower end of ulna is needed.

2- Dupuytren's contracture

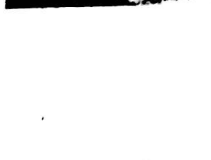
- It is a flexion deformity of the fingers.
- Due to progressive **contraction** of palmar fascia.
- Treated by **fasciotomy** or **excision** of palmar fascia.

3- Polydactly

- **Supra-numeral** finger.
- The extra-finger should be amputated.

4- Syndactly

- **Fusion** of adjacent fingers.
- Two or more fingers are joined together by a web of skin. The web is divided & the raw areas are covered by graft



II- DEFORMITIES OF HIP JOINT

Congenital hip dislocation

INCIDENCE

- 1 : 1000 new born babies
- Girls > boys.
- Lt. hip > Rt. hip.

AETIOLOGY

- ① There is a familial tendency
- ② Intra-uterine malposition
- ③ Postnatal posture

PATHOLOGY

- The **acetabulum** is unusually shallow.
- The **femoral head** slides out posteriorly then upwards.
- The **joint capsule** is stretched.

CLINICAL PICTURE

By (**observant mother**)

Waddling gait with asymmetry of the buttocks.

With **unilateral dislocation**

- ① The skin creases lie at **different** levels on the two sides.
- ② The affected leg is slightly short & rotated externally.

Bilateral dislocation :

It is more difficult to be detected, because there is **no** asymmetry.

EXAMINATION

1- Ortolani's test :

The baby's thigh are held with the middle finger behind the greater trochanter which is pressed forwards. So the test is **+ve** if **there is a click** during the **abduction manoeuvre** indicating that the hip has been reduced.

2- Barlow's test :

If the hip already reduced, the **adduction manoeuvre** will allow the femoral head to be gently out of the socket

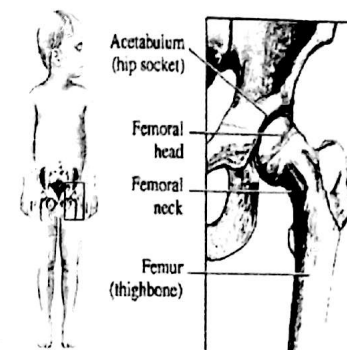
INVESTIGATIONS

1. X-ray.

It is of **little** value in the newborn because the **head** of femur is cartilaginous i.e. not visible.

2. U/S scanning

Can visualize the shape of the **acetabulum** & the position of the femoral head



TREATMENT

(According to the age)

1- In the newborn

Wait for 3 weeks, if the hip is still unstable, it is reduced in abduction & splinted in abduction (**Von Rosen splint**) this is maintained for 3 - 6 months.

2- Between the age of 6 months to 6 years

Gradual closed reduction is applied & splintage for 12 months then operative reduction.

3- After the age of 6 years

Open reduction + formation of a shelf at the superior acetabular margin to deepen it & prevent re-dislocation.



III- DEFORMITIES OF KNEE JOINT

1- Genu valgum

Knock knees

DEFINITION

Fixed abduction of the legs from middle line.

CAUSES

- 1- **Idiopathic** : the commonest & bilateral.
- 2- **Rickets**
- 3- **Static** : long standing in wrong position.



CLINICAL PICTURE

The knees knock together & on walking the patient flex the knees slightly.

TREATMENT

- A. **Conservative** Physiotherapy + elevation of inner border of shoes
- B. **Operative** **Mc Ewen's** supra-condylar osteotomy

2- Genu varum

Bow legs

DEFINITION

Lateral bowing deformity of the leg.

CAUSES

Similar to genu valgum.

CLINICAL PICTURE

The medial malleoli touching each other

TREATMENT

Similar to genu valgum.



IV. DEFORMITIES OF THE FOOT

1- Talipes equino-varus

Club foot

DEFINITION

- ⇒ **TALIPES** : Means deformity of hind-foot.
- ⇒ **EQUINES** : Means planter flexion of ankle.
- ⇒ **VARUS** : Consists of
 - **Inversion** of the heel
 - **Adduction** of the fore-foot

Normal

Club foot

INCIDENCE

- Common deformity of foot.
- Boys : girls (2 : 1).
- Bilateral = 1/3 of cases.

AETIOLOGY

A- Congenital

Commonest **congenital** skeletal deformity.

B- Acquired

- **Paralytic** : polio or lat. popliteal n. injury.
- **Spastic** : Hemiplegia.
- **Cicatricial** : Extensive scarring after trauma.
- **Decubitus** : Prolonged bed rest with pressure on the dorsum of foot.

CLINICAL PICTURE & DD

	CONGENITAL	PARALYTIC
ONSET	Since birth	Following cause.
SIDE	Bilateral	Unilateral
MUSCLES	Good Tone	Paralyzed
ABILITY TO WALK	Can on outer side of foot	Patient can't walk

TREATMENT

A- Stretching & splinting

Treatment begins within 2 or 3 days of birth for 6 - 8 weeks until the foot is over corrected.

B- Operation for (resistant cases)

The Tendo-achillis is lengthened & the planter flexors are elongated or divided & held in plaster cast.

C- Treatment after correction

Splintage continues until the child starts walking

2- Flat foot

Pes planus

DEFINITION

Loss or flattening of the longitudinal arches of the foot.

CAUSES

A. Congenital

Congenital vertical talus.

B. Acquired

- 1- Spasmodic : Spasm of long extensors of the toes.
- 2- Traumatic : Fracture of small bones of foot.
- 3- Paralytic : Flaccid paralysis of tibial muscles.
- 4- Static (postural) : Most common due to bad posture + muscle hypotonia especially with prolonged standing.

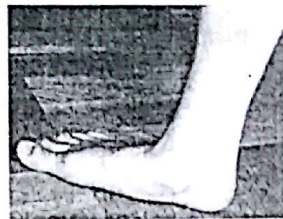
N.B.: The arches of foot are kept by :

- 1- Ligaments : e.g. Spring, deltoid & plantar ligaments.
- 2- Short Muscles of sole & long tendons from back of leg.



STAGES

- 1- Acute foot strain : i.e. Painful swollen foot.
- 2- Chronic = Mobile flat foot.
If neglected painless & flat foot.
- 3- Rigid flat foot i.e. irreversible.



TREATMENT

A- If mobile :

Rest, physiotherapy & special boots

B- If rigid :

Wedge tarsectomy



Bone & joint inflammations



BONE INFLAMMATIONS

I- ACUTE HEMATOGENOUS OSTEOMYELITIS

INCIDENCE

- Age : Almost disease of CHILDREN.
- Sex : Male > female.

AETIOLOGY

Organism

Usually staphylococcus aureus (80 %) & others as streptococcus pyogenes, streptococcus hemolyticus ... etc.

Predisposing factors

Following a mild trauma → hematoma at metaphysis of long bones.
The hematoma is infected from circulating bacteria (septic focus).

Route of infection

Hematogenous from septic focus.

PATHOLOGY (Resulting pus spread)

Transversely

Raising the periosteum → Sub-periosteal abscess which →

- ① Opens on skin surface → Skin sinus.
- ② Spreads intra-articular → Septic arthritis

Vertically

Through the medullary cavity which may interrupt blood flow in nutrient artery → Necrosis of bone → separation of bone → Sequestrum.

Blood stream

Leads to → Pyaemia.

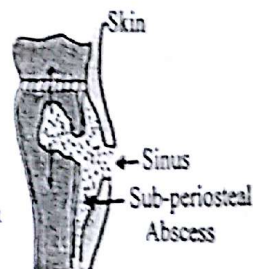
CLINICAL PICTURE

Type of patient Usually male & child.

General Fever, Headache, Malaise & Anorexia

Local

- 1- **Severe pain** over metaphysis with hotness, redness & edema of overlying skin.
- 2- **Limitation of movement** of painful limb.
- 3- **Picture of complications :**
 - ① Subperiosteal abscess & skin sinus.
 - ② Septic arthritis & pyaemia.
 - ③ Chronicity & pathological fracture.



DIFFERENTIAL DIAGNOSIS

- 1- **Cellulitis** = No tenderness over bone.
- 2- **Rheumatic arthritis** = Fleeting character + carditis.
- 3- **Ewing's sarcoma** = Swelling is diaphyseal + characteristic x-ray

INVESTIGATIONS

A- Laboratory

Leucocytosis, ↑ ESR & +ve blood culture.

B- Radiological (X-ray)

Normal during the 1st 2 weeks then rarefaction appears.

C- Aspiration of pus the most diagnostic

TREATMENT

A- General treatment

Rest in bed + A.B as **Flucloxacillin** or **Cephalosporins**

B- Local treatment

Rest of the limb in a splint to ↓ pain & toxemia.

⇒ If no response in 24 hours

Surgical drainage (under general anesthesia & tourniquet)
By evacuation of sub-periosteal abscess.

N.B. : Some surgeons advise drilling of the cortex
To evacuate any pus in the medullary cavity.



III. CHRONIC NON SPECIFIC OSTEOMYELITIS

1- Following improper ttt of acute osteomyelitis

PATHOLOGY

1- Sequestrum :

Separated dead piece of bone 2nd to interference with its blood supply.

2- Abscess cavity :

Containing the sequestrum.

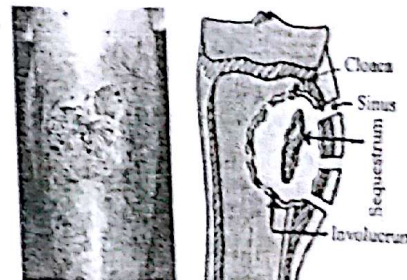
3- Involucrum :

New bone formed by the raised periosteum from chronic irritation.

4- Cloaca :

Multiple openings evacuating pus out through the involucrum.

5- Multiple sinuses : Discharging pus over skin.



CLINICAL PICTURE

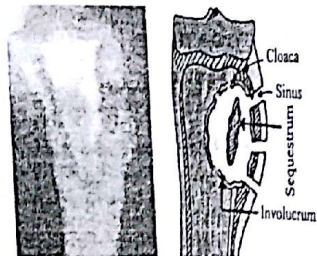
History of acute osteomyelitis.

Symptoms

- General : Fever, Headache, Malaise & Anorexia.
- Local : Pain & swelling at bone.

Signs

Bone thickening & tenderness
+ multiple skin sinuses.



INVESTIGATIONS (X-ray)

Sequestra in a cavity surrounded by involucrum.

TREATMENT

- 1- **Sequestrectomy** : Removal of sequestrum by opening the cavity in bone.
- 2- **Saucerization** of bone cavity.
- 3- **Excision** of the sinus tract.
- 4- **Obliteration** of the dead space by cancellous bone chips

2- Chronic osteomyelitis from the start

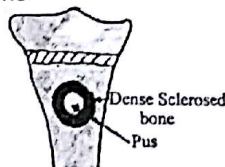
A- Brodie's abscess

DEFINITION

Localized suppurative chronic osteomyelitis affecting patient with good resistance low virulence staph, albus.

PATHOLOGY

A chronic bone localized abscess at metaphysis of long bone & surrounded by dense sclerosed bone containing pus.



INVESTIGATIONS (X-ray)

There is a translucent area surrounded by sclerosis.

TREATMENT

Under antibiotic covering the cavity is deroofed.

B- Garre's type

DEFINITION

Non suppurative chronic osteomyelitis affecting patient with good resistance low virulence staph, albus.

PATHOLOGY

Excessive bone formation which may encroach the medullary canal of shaft of long bones

INVESTIGATIONS (X-ray)

Excessive bone at medullary canal..

TREATMENT

Guttering of the cortex to release the tension in the medullary canal.

JOINT INFLAMMATIONS

SEPTIC ARTHRITIS

INCIDENCE

- **AGE** : Common in children.
- **ORGANISM** : Mainly staphylococcus aureus.
- **ROUTE OF INFECTION** :
 - ① **Hematogenous** : Commonest from a distant focus affecting one or many joints (pyaemic joint)
 - ② **From outside** : Compound dislocation (rare) or penetrating wounds.
 - ③ **From adjacent bone** : Osteomyelitis (rare).
 - ④ **From intra-articular injection or aspiration** Through contaminated needle



PATHOLOGY

- **THE SYNOVIAL MEMBRANE** (synovitis) becomes red, swollen & exudes pus.
- **THE ARTICULAR CARTILAGE** (condrolysis). i.e. Articular cartilage destruction with exposure of both bone ends.
- **LIGAMENT & MUSCLE SPASM** when pus burst outside the joint.

CLINICAL PICTURE

Symptoms

- General : Fever, Headache, Malaise & Anorexia.
- Local : Severe throbbing pain & swelling of the affected joint.

Signs

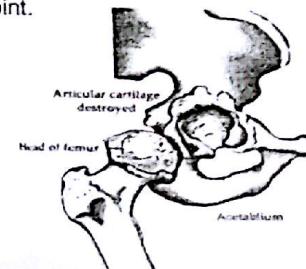
- ① Joint deformity with limitation of movement.
- ② Redness, hotness & edema overlying joint.
- ③ Muscle spasm.

DIFFERENTIAL DIAGNOSIS

- 1- **ACUTE OSTEOMYELITIS**
- 2- **RHEUMATIC FEVER**
- 3- **HEMOARTHROSIS**

COMPLICATIONS

- 1- **CHRONIC ARTHRITIS**
- 2- **PYAEMIA**
- 3- **PATHOLOGICAL DISLOCATION** due to tension of joint, muscle spasm & ligament laxation.



INVESTIGATIONS

A- Laboratory

Leucocytosis & ↑ ESR.

B- Radiological (X-ray)

Normal during the 1st 2 weeks
then rarefaction appears of the articular
ends of bone & narrow joint space.

C- Aspiration of pus the most diagnostic



TREATMENT

A- General treatment

Rest in bed + A.B as **Flucloxacillin**
or **Cephalosporins**

B- Local treatment

1- Repeated aspiration of joint & local injection of antibiotics.

N.B.: Value of aspiration :

- ① Diagnostic.
- ② Therapeutic (↓ pain, ↓ tension & ↓ toxemia)
- ③ Prognostic (follow up)

2- Arthrotomy (open drainage)

INDICATIONS

- ① Failure to respond to aspiration.
- ② Thick pus i.e. difficult aspiration
- ③ Suction irrigation.

TECHNIQUE

Joint opened, pus evacuated, washed with saline, instilled with penicillin. Capsule is closed using plain catgut & skin left open + 2nd suture after 1 week.

3-Splintage of joint

In best position of function indicated if the articular cartilages are completely destroyed.

Generalized disorders of bones & joints

I- PAGET'S DISEASE

Osteitis deformans

INCIDENCE

(Rare) more in males between 50 -70 years.

CAUSES

(Unknown) but it may be due to disturbance of endocrinal control of bone metabolism

PATHOLOGY

- **Site** : The disease is usually generalized but the bones principally affected are skull, spine, pelvis & lower limbs
- **At first** the bones are decalcified & soften.
- **Later on** the bones are greatly thickened by deposition of sub periosteal bone



CLINICAL PICTURE

Dull aching bony pain, ↑ size of head, thickening & bending of bones **Gorilla like appearance** to the patient.

COMPLICATIONS

- 1- **NERVE COMPRESSSION** (blindness & defness)
- 2- **PATHOLOGICAL FRACTURES**
- 3- **OSTEOARTHRISIS** of the joint adjacent to deformed bone.
- 4- **OSTEOSARCOMA**

TREATMENT

No treatment **except** when complications arise.

II - PERTH'S DISEASE

Osteochondritis juveniles of the hip

INCIDENCE & CAUSES

Idiopathic disease of children.

PATHOLOGY

- **At first** the femoral head becomes ischemic, softened & fragmented.
- **Later on** bone repair takes place & the deformity is well established.



CLINICAL PICTURE

The child complains of intermittent limping.

TREATMENT

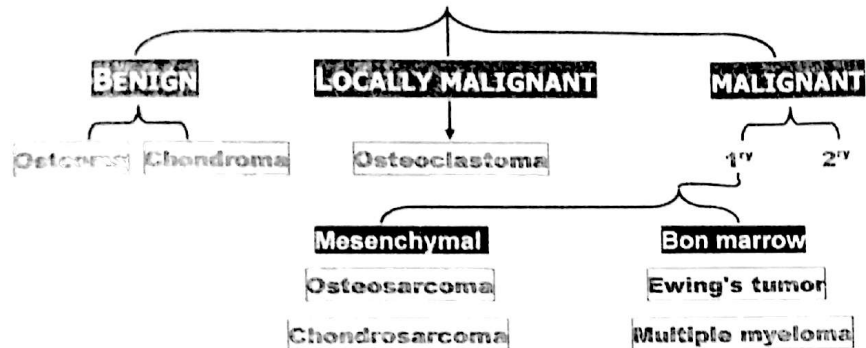
A. ACUTE PHASE : Bone traction to prevent deformities.

B. IF THE DEFORMITY IS ESTABLISHED : Corrective osteotomy

Bone tumors



JOINT TUMORS



I- BENIGN TUMORS

1- Osteoma

A- Ivory (compact) osteoma

INCIDENCE

- Rare benign tumor.
- It occurs with adolescent & young adult.

PATHOLOGY

- **ORIGIN** : Arises from membranous bone.
- **SITE** : Skull or mandible.
- **N/E** : Rounded, conical or sessile at outer surface.



CLINICAL PICTURE

- Asymptomatic mass except if complicated.

COMPLICATIONS (Depend on site)

- 1- **OUTER SKULL TABLE** : Stretch skin leads to localized alopecia.
- 2- **INNER SKULL TABLE** : Compresses the brain.
- 3- **ORBIT** : Proptosis.
- 4- **NOSE** : Block air sinuses.
- 5- **EXTERNAL AUDITORY MEATUS (E.A.M)** : Deafness & vertigo.

INVESTIGATIONS (X-ray)

Shows a **sessile** plaque of dense bone.

TREATMENT

Never turns malignant. So **excision** with complicated cases only

B- Cancellous osteoma

(OSTEOCHONDROMA - CARTILAGE CAPPED EXOSTOSIS)

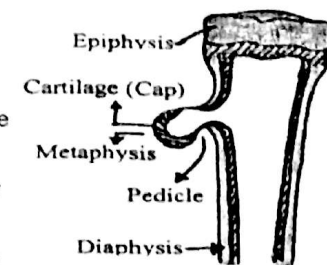
INCIDENCE

- Common benign tumor.
- It occurs with adolescent & young adult.

PATHOLOGY

- **ORIGIN** : Arises on external surface of bone capped by cartilage
- **SITE** : Metaphysis of long bones especially around the knee.
- **N/E** : Smooth, pedunculated bony swelling covered by a **cape** of cartilage.

N.B. : It tends to moves away from epiphysis



CLINICAL PICTURE

- It may be **single** or **multiple** (hereditary multiple exostoses).
- Asymptomatic mass except if complicated.

COMPLICATIONS

1- COMPRESSION ON

- ① **Nerves** leads to pain or paraesthesia
- ② **Vessels** leads to distal ischemia.
- ③ **Joint** leads to mechanical block.

2- SARCOMATOUS CHANGES (5 %)

Known by

- ① Pain & rapid growth.
- ② Invasion of mother bone.
- ③ Recurrence after excision.

INVESTIGATIONS (X-ray)

Shows a well defined bony swelling emerging from metaphysis.

TREATMENT

Excision with its base + biopsy.



C- Osteoid osteoma

INCIDENCE

It affects < 30 years & usually **male**.

PATHOLOGY

- **ORIGIN** : Benign osteoblastic lesion.
- **SITE** : Shaft of long bone (> 50 % femur or tibia).
- **N/E** : Small lesion < 1 cm & rounded or oval in shape

CLINICAL PICTURE

Painful small lesion which sometimes severe)

INVESTIGATIONS (X-ray)

Small **radiolucent** area surrounded by dense sclerosis with central small **nidus** of calcification.

TREATMENT

The only effective treatment is removal of **nidus**

[D] Osteoblastoma

(GIANT OSTEIOD OSTEOMA)

IT DIFFERS FROM OSTEIOD OSTEOMA by :-

- ① Large in size (>1 cm)
- ② Less painful
- ③ No reactive bone.
- ④ It Occurs in vertebrae, ribs, hand & foot.

INVESTIGATION (X-ray)

Well demarcated osteolytic lesion, the surrounding sclerosis is **not** always.

TREATMENT

Excision & bone grafting.

2- Chondroma

INCIDENCE

It affects **short long** of hands & feet.

PATHOLOGY

- **ORIGIN** : It is a benign tumor characterized by formation of mature cartilage.
- **SITE** : Situated centrally (**Enchondroma**), or eccentric (**Ecchondroma**).
- **N/E** : Lobulated mass of cartilage.

CLINICAL PICTURE

- Mild painful swelling with pathological fracture.
- It may be solitary or multiple (**Ollier's disease**)

INVESTIGATION (X-ray)

- Well defined radiolucent shadow with frequent calcification
- Enchondroma causes **thinning** of cortex with little or no expansion.
- Enchondroma causes **eccentric expansion** of cortex.

TREATMENT

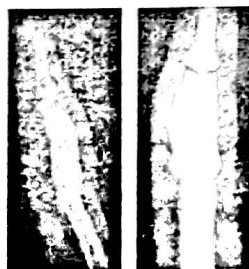
Curettage & bone grafting.



Enchondroma



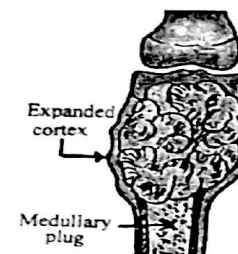
Ecchondroma



II- LOCALLY MALIGNANT

3- Osteoclastoma

Giant cell tumor



PATHOLOGY

- **ORIGIN** : Uncertain but most probably **spindle cells**
- **SITE** : **Epiphysis** of long bone especially around knee & humerus.
- **N/E** : - Slowly growing causes bone expansion with thinning of the cortex.
- Intra-medullary spread never occur.

III- MALIGNANT TUMORS

4- Osteosarcoma



- **ORIGIN** : **Osteoblasts** (osteolytic or osteosclerotic)
- **SITE** : **Metaphysis** of lone bone especially around knee & humerus.
- **N/E** : - Rapidly growing causes erosion of the cortex i.e. "**Bone ghost**".
- The periosteum becomes raised & the tumor spreads sub-periosteally.
- Intra-medullary spread will occur.

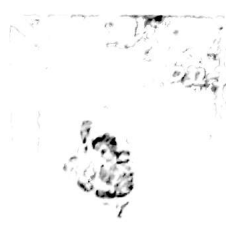
- The articular cartilage is preserved.

- Reddish & fleshy appearance

- **Osteolytic** : Soft, fleshy & vascular with areas of Hge & necrosis
- **Osteosclerotic** : Solid & contain bone

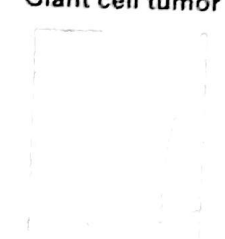
IT SHOWS 4 PATHOLOGICAL FEATURES.

- 1- Bone destruction (**ghost**)
- 2- Tumor bone formation (**Sun rays appearance**) on radiology.
- 3- Reactive bone formation (**Codman's triangle**) on radiology
- 4- Soft tissue infiltration.

	LOCALLY MALIGNANT	MALIGNANT TUMORS
	Osteoclastoma	Osteosarcoma
	Giant cell tumor	
		
	Giant cells spindle cells - CELLS : Spindle cells + multinucleated giant cells - MATRIX : Stroma with no bone or cartilage.	osteoid cells - CELLS : Cellular pleomorphism with osteoid cells. - MATRIX : Stroma with bone or cartilage.
• M/P:		
CLINICAL PICTURE		
• AGE :	20 - 40 years After epiphyseal union.	10 - 20 years Before epiphyseal union.
• SEX :	Male = female	Male > female
• SYMPTOMS :	1- Pain at end of long bone. 2- Bony swelling before pain. 3- Pathological fracture (common).	1- Pain is 1st symptom. 2- Bony swelling after pain. 3- Pathological fracture (rare).
• SIGNS :	1- SWELLING : - Well defined edge. - At end of long bone. - Variable in consistency with egg-shell crackling sensation 2- L.Ns : Not detected.	1- SWELLING : - Ill defined edge. - At shaft of long bones. - Variable in consistency. 2- L.Ns : Hard & painless.
COMPLICATION	1- Pathological fracture. 2- Recurrence rate (common).	1- Early blood metastasis. 2- Pathological fracture (rare)

INVESTIGATION

A- X-ray

	LOCALLY MALIGNANT	MALIGNANT TUMORS
	Osteoclastoma	Osteosarcoma
	Giant cell tumor	
		
	1- Soap bubbles appearance. 2- Expanded cortex. 3- Medullary plug = Operculum 4- Respect articular cartilage.	1- Bone destruction (ghost) 2- Tumor bone formation (Sun rays appearance) 3- Reactive bone formation (Codman's triangle) 4- Soft tissue infiltration 5- Respect articular cartilage
B- CT scan & MRI	Diagnostic	Diagnostic give Idea about metastasis.
C- Chest x-ray	(-ve) metastasis	(+ve) metastasis
D- Biopsy	To confirm the diagnosis	

N.B.: Variants of osteosarcoma

1- **PAROSTEAL (JUXTACORTICAL) TYPE :**

- Slowly growing occurs in adult (> 20 years)
- It arises from external bone surface with late medullary invasion

2- **PERIOSTEAL OSTEOSARCOMA :**

- Rare involve short segment of cortex of tibial shaft.
- The medullary cavity not involved.

3- **OSTEOSARCOMA IN PAGET'S DISEASE :**

- High grade anaplastic tumor occurs with old age > 60 year

4- **POST-IRRADIATION sarcoma** of bone.5- **INTROSSEOUS LOW GRADE osteosarcoma**6- **INTROSSEOUS HIGH GRADE osteosarcoma**

TREATMENT

A. Osteoclastoma (LOCALLY MALIGNANT)

- 1- The simplest treatment is curettage & bone graft, but recurrence is common
- 2- Wide excision (the choice) with replacement by prosthesis
- 3- Amputation is indicated for tumors which recur with increasing evidence of malignancy

B. Osteosarcoma (1st MALIGNANT)

1- Amputation : (The Main)

N.B.: The level of amputation

Should be proximal to the joint above the tumor
e.g. Osteosarcoma at the tibia is treated by an above knee amputation

2- Limb preserving surgery :

Excision of the tumor & bone replacement with prosthesis or bone graft with pre & post-operative radiotherapy

3- Chemotherapy may be used after above mentioned lines to improve prognosis.

5- Chondrosarcoma

INCIDENCE

It occurs with 40 - 50 years (Male > female).

PATHOLOGY

- **ORIGIN** : Malignant tumor characterized by formation of cartilage
- **SITE** : Mostly in pelvic bone & upper end tibia
- **N/E** : 2 types
 - A. Primary :
Arises spontaneously in previously normal bone.
 - B. Secondary :
Occurs on top of multiple enchondromatosis.

CLINICAL PICTURE

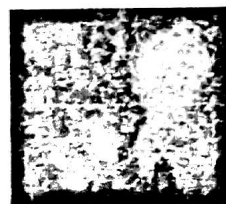
- ① Dull ache pain.
- ② Gradual enlarged mass.
- ③ Pathological fracture.

INVESTIGATION (X-ray)

Tumor shadow with radiolucent areas of cartilage spotted with area of calcifications (very fluffy)

TREATMENT

Wide local excision (radio-resistant).



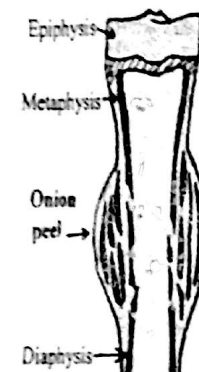
6- Ewing's sarcoma

INCIDENCE

- Rare malignant tumor.
- It occurs 10 - 20 years (Male > female)

PATHOLOGY

- **ORIGIN** : malignant endothelioma of bone marrow
- **SITE** : Diaphysis of long bones
- **N/E** : Soft, grayish like mass starting at diaphysis then erodes the cortex, raising the periosteum which will react by new bone formation as the process repeat itself.
So it gives **onion peel appearance**
- **M/E** : Rounded cells arranged in a **rosette** around the blood vessels



CLINICAL PICTURE

- ① Painful warm bony swelling (The chief presenting features).
- ② Intermittent increasing in temperature.

DIFFERENTIAL DIAGNOSIS

- Acute osteomyelitis :

Biopsy will establish the diagnosis

SPREAD

- A- Blood born metastasis
Early to lungs & other bones.
- B- Lymphatic spread
To regional lymph nodes.

INVESTIGATIONS

- A- Laboratory
Leucocytosis, ↑ ESR
- B- Radiological (X-ray)
Onion peel appearance
- C- Bone scan
May shows multiple areas of activity in the skeleton.
- D- CTscan & MRI
Reveal the local extent of the tumor.

TREATMENT

The prognosis is always poor

So the best result from combination of chemotherapy & radiotherapy as pre-operative then amputation.

Then a further course of chemotherapy for 1 year is given



IV. METASTATIC BONE DISEASE

INCIDENCE

Metastatic deposits $>1^{\text{st}}$ bone tumor.

SOURCE

Direct As cancer tongue infiltrate mandible.

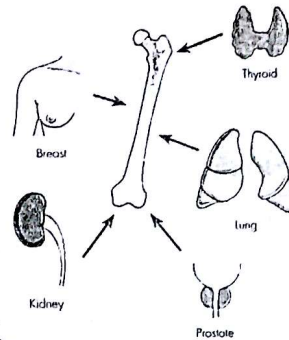
Blood As thyroid, lung, breast, supra-renal, kidney & prostate.

PATHOLOGY

Site Commonest in skull, sternum, ribs, vertebrae & pelvis.

N/E - Osteolytic causing bone destruction.

- **Osteosclerotic** causing bone formation.



CLINICAL PICTURE

Picture of 1st tumor +

- ① Severe bony pain.
- ② Pathological fracture
- ③ Palpable bony swelling (rarely).

INVESTIGATIONS

A- Laboratory

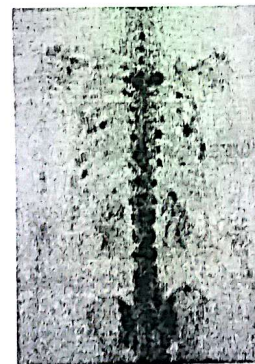
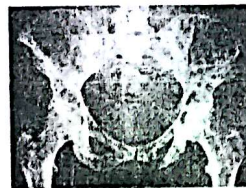
Serum alkaline phosphatase is often $\uparrow\uparrow$
also serum acid phosphatase is $\uparrow\uparrow$ with cancer prostate

B- Radiological (X-ray)

Shows osteolytic activity

C- Bone scan

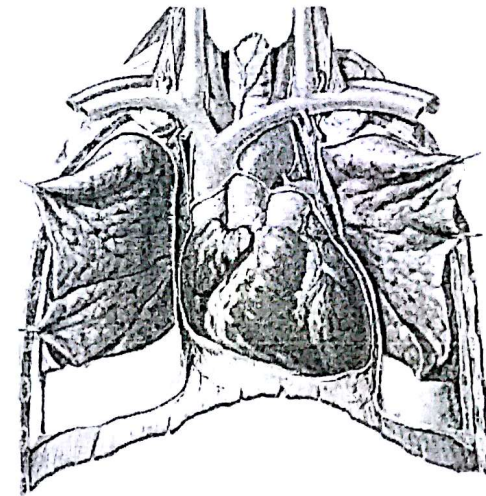
May shows multiple areas of activity in the skeleton.



TREATMENT

- 1- **Chemotherapy & radiotherapy**.
- 2- **Hormonal treatment** may be helpful.
- 3- **Internal fixation** for pathological fracture.

CARDIOTHORACIC





Chest injuries



CHEST INJURIES

AETIOLOGY (Trauma)

A- Closed trauma

- 1- Direct : Blunt trauma e.g. car accident
- 2- Indirect : Blast injuries to the chest.

B- Opened trauma

- 1- Gunshot wounds.
- 2- Punctured due to stabbing.

THE FOLLOWING INJURIES MAY OCCUR

- 1- RIBS : 1- Simple fracture.
- 2- Flail chest.

- 2- PLEURA : 1- Pneumothorax.
- 2- Hemothorax.

- 3- LUNGS : 1- Contusions.
- 2- Lacerations.

- 4- C.V.S : 1- Cardiac injuries.
- 2- Great vessels injury.

5- DIAPHRAGMATIC INJURIES

6- OESOPHAGEAL INJURIES

CAUSES OF DEATH

VENTILATION MAY BE SERIOUSLY AFFECTED IN CHEST INJURIES due to

- ① Severe pain due to rib fractures.
- ② Instability of the chest wall due to the presence of a flail segment.
- ③ Lung collapse due to hemothorax or pneumothorax.
- ④ Pulmonary contusion.
- ⑤ Accumulation of secretions in the tracheobronchial tree.
- ⑥ Depression of respiratory center due to associated head injury.

MANAGEMENT OF ANY CHEST INJURY

1- First aid treatment

" Pre-hospital management "

- ① Ensure patent airway if patient is unconscious
- ② Control of bleeding by compression
- ③ Sterile dressing to prevent contamination.

Then Transfer the patient to hospital



Definitive treatment

" Hospital management "

The American College of Surgeons developed the Advanced Trauma Life Support (ATLS)

ATLS protocol has 3 elements :

1- Primary survey / resuscitation

- A = Air way maintenance
- B = Breathing.
- C = Circulating i.e control bleeding.
- D = Disability i.e. support any fracture.
- E = Exposure of the patients.

2- Secondary survey

3- Definitive treatment of individual injuries

Primary survey / resuscitation

A- Airway

1- CLEAR AIRWAY

- Vomitus, blood or foreign material should be removed, this is followed by chin lift or jaw thrust

2- AIRWAY CONTROL

- 1- Oro-pharyngeal tube to prevents backward falling of the tongue

- 2- Endotracheal tube is indicated with

- a. Apnea
- b. Inhalation injuries.
- c. Maxillofacial trauma
- d. Closed head injuries

3- CERVICAL CONTROL

- Cervical spine immobilization is done using a backboard and a rigid collar

B- Breathing

ASSESSMENT

- ⇨ Inspection for chest movement, respiratory rate, cyanosis, open chest wound & expansion.
- ⇨ Palpation for subcutaneous emphysema & flail segments
- ⇨ Percussion for hyperresonance or dullness over lung field
- ⇨ Auscultation for air entry & adventitious sound.



LIFE THREATENING CONDITIONS & THEIR TREATMENT

- ① Flail chest : Immobilized by cotton pad & adhesive plaster from sternum to spine
- ② Tension pneumothorax : Deflated by needle which is inserted in 2nd inter-costal space
- ③ Massive hemothorax : Under water seal drainage



C- Circulation

ACTION

- ⇒ Control of bleeding by local compression, elevation or packing
- ⇒ Anti-shock measures (discuss)
- ⇒ ECG monitoring.
- ⇒ CPR for cardiac arrest.



D Disability

- Common causes of neurological deficits related to trauma are :- Head injury, hypoxia, shock, alcohol or drug abuse

AVPU Evaluation based on patient's best response.

Alert & interactive.

Vocal stimuli elicit a response

Painful stimuli are necessary to produce a response

Unresponsive

- A more detailed assessment using Glasgow Coma Scale (GCS)

E. Exposure

- Clothes of the trauma victim are removed using a sharp large scissors.
- Warmth using blankets to prevent hypothermia.
- Insert ① Urethral catheter (Foley's) to monitor urine output. this is contraindicated if there rupture urethra

- ② Nasogastric tube (Ryle's) to decompresses the stomach & to prevents vomiting & aspiration

N.B.: Proper history taking (AMPLE)

- Allergies
- Medications
- Past medical history
- Last meal (time)
- Events of injury

Secondary survey

- The secondary survey is to be done after resuscitation efforts, after radiological assessment as plain x-rays, CTscan, MRIetc.

- It includes examination of :-

- ① Head & neck
- ② Face & spine
- ③ Chest & abdomen (diagnostic peritoneal lavage) are indicated in blunt abdominal trauma
- ④ Perineum (including rectal & vaginal examinations if females)
- ⑤ Nervous system
 - Pupils for size, equality & reaction to light
 - GCS
 - Cranial nerves
 - Sensation & motor activity in limbs
- ⑥ Limbs



After 1st aid treatment, the following investigations are done :

1. Laboratory :

- Arterial blood gases to estimate P O₂ & P CO₂.
- Blood sugar for diabetes.
- Blood urea to exclude uremia.

2. Radiological :

- Plain chest x-ray : (A-P & lateral views).
- CT scan chest.
- Duplex scan for vascular injuries.

3. Instrumental :

- ECG, Echo & C.V.P. for cardiac injuries.
- Bronchoscopy : if tracheo-bronchial injury is suspected.
- Oesophagoscopy to exclude oesophageal injuries.

II- Definitive treatment

Each condition is treated accordingly

III- Urgent thoracotomy

INDICATIONS

- ① Severe bleeding (> 120 ml/hour).
- ② Initial volume of blood coming though the intercostal tube (> 2 L)
- ③ Persistent bleeding.
- ④ Loculated hemothorax.
- ⑤ Old clotted hemothorax.
- ⑥ Associated intra-thoracic injuries

THE FRACTURED RIBS ARE SECURED by stainless steel wires

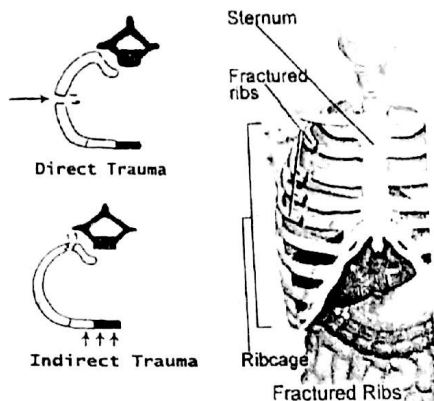
I - RIB FRACTURES

A - Isolated Fracture of the rib

AETIOLOGY (Trauma)

Direct Blow or crush.

Visceral injuries are common as the broken ends are driven **inwards**



Indirect Antero-posterior crush.

Visceral injuries are rare as the broken ends are driven **outwards**

Spontaneous Muscular violence (rare).

e.g. during violent sneezing, coughing or lifting a heavy object with old people
i.e. senile osteoporosis.

CLINICAL PICTURE

A. History of trauma.

B. Generally may reveal associated injuries as spleen, liveretc

C. Locally

- 1- Sharp pain increased by breathing & cough.
- 2- Localized tenderness & crepitus at the fractured site.
- 3- Complications :
 - ① Surgical emphysema.
 - ② Pneumothorax.
 - ③ Hemothorax.

MANAGEMENT (Not urgent except if complicated)

I- 1st aid treatment & investigations As before

II- Definitive treatment

The Aim with uncomplicated fracture rib is relieving pain by 1- **Strong analgesics** as pethidine or N.S.A.I.Ds.
Support the affected side by adhesive plaster.

- 2- In **elderly** an elastic corset may be useful
- 3- Inter-costal nerve block.

III- Urgent thoracotomy

Not used except if indicated.



B- Double fracture of ribs (Flail chest)

DEFINITION

Several ribs are broken both anteriorly & posteriorly
So a segment of chest wall becomes **flail**

AETIOLOGY (Trauma)

It occurs with severe crush injuries.
So leads to

(1) Paradoxical respiration :

- The affected lung collapses during inspiration & expands slightly during expiration.

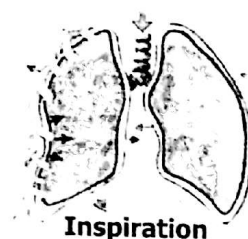
- This is explained by the fact that the flail part is sucked-in during inspiration & so compresses the lung, driving air from it into the opposite lung. **The reverse occurs during expiration.**

(2) Pendulum respiration :

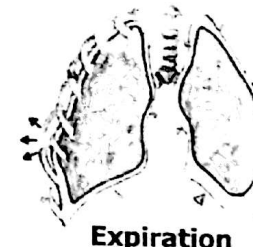
- The **paradoxical respiration** leads to the oscillation of gases from one lung to the other & results in accumulation of CO₂ in the blood.

(3) Mediastinal flutter :

- It is the movement of the mediastinum from side to side during respiration, this impedes the heart action.



Inspiration



Expiration

CLINICAL PICTURE As simple fracture rib +

- ① Increasing dyspnea & cyanosis.
- ② Tachycardia.
- ③ Restlessness.

MANAGEMENT

I- 1st aid treatment & investigations As before

II- Definitive treatment

IF FLAIL SEGMENT IS SMALL

External immobilization by cotton pad + adhesive plaster.

IF FLAIL SEGMENT IS LONG

Internal immobilization by intermittent +ve pressure breathing (IPPB).

III- Urgent thoracotomy

Not used except if indicated.



II- PNEUMOTHORAX

DEFINITION

Accumulation of air in the pleura

AETIOLOGY

1- Traumatic pneumothorax :

by either blunt or penetrating injuries.

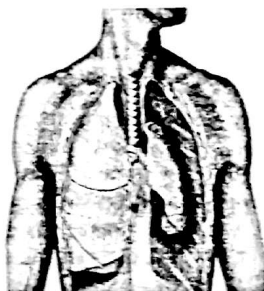
2- Spontaneous pneumothorax :

by rupture of an emphysematous bulla, cystic lung or T.B. cavity.

3- Iatrogenic pneumothorax :

by either

- ① +ve pressure ventilation that is complicated by rupture of alveoli.
- ② During insertion of a central venous line



TYPES

There are 3 types :

1- Simple pneumothorax

AETIOLOGY

due to entry of air in the pleura through lung laceration

CLINICAL PICTURE

Chest pain & slight dyspnea

TREATMENT

- If the amount of air is small (The patient is not dyspneic)
Conservative treatment until spontaneous absorption takes place.
- If the amount of air is large (The patient is dyspneic)
An intercostal tube is inserted until expansion of the lung becomes complete.

2- Open pneumothorax = Sucking chest wound

AETIOLOGY

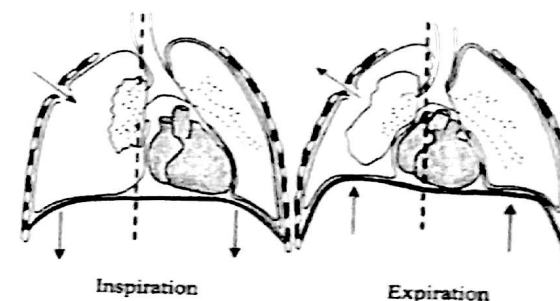
due to sucking chest wound which allow the free entry & exit of air during respiratory movement.

EFFECTS

The normal lung expands, while on open side, air is sucked in the pleural cavity during inspiration & the lung collapses, during expiration as the normal lung collapses, it expels some air in the affected lung which expands slightly → ↑ CO₂ tension in blood.

So leads to

- (1) Paradoxical respiration
- (2) Pendulum respiration
- (3) Mediastinal flutter



CLINICAL PICTURE

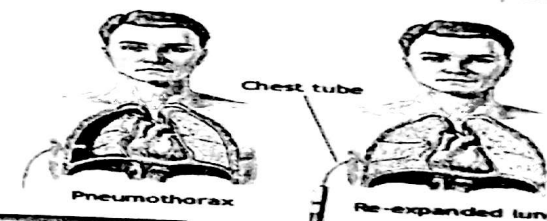
- ① Chest pain, dyspnea & cyanosis.
- ② There is **absent** breath sound with hyperresonance on the affected side & the mediastinum is **central**.
- ③ Sucking chest wound produces characteristic **noise of in-out air** movement

TREATMENT (Emergency)

I- 1st aid treatment & investigations As before

II- Definitive treatment

- Immediate application of an adhesive external dressing to stop movement of air through the defect
- The wound is then repaired in theatre, & intercostal tube is inserted to drain the air in the pleural cavity.



III- Urgent thoracotomy

Not used except if indicated.

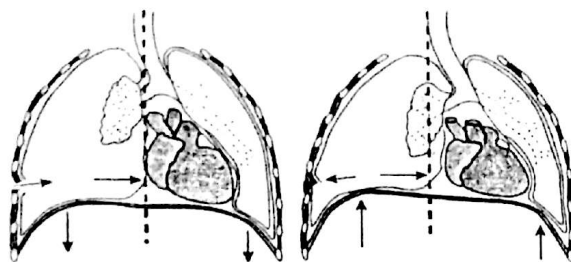
3- Tension pneumothorax

AETIOLOGY

due to opening in the pleural cavity either through the chest wall or from the lung, permits entrance of air during inspiration, but **prevents its exit** during expiration i.e. valvular wound

EFFECTS

The air in the pleural cavity accumulates under tension, compressing the lung & displacing the heart & mediastinum towards the opposite side, so the intrathoracic negativity is lost, interfering with venous return & cardiac filling.



Inspiration

Expiration

CLINICAL PICTURE

- ① Severe dyspnea & cyanosis.
- ② There is **absent** breath sound with hyperresonance on the affected side & the mediastinum is **shifted to opposite** side.
- ③ Respiratory arrest may occur.
- ④ **Local examination**
 - **Inspection** = Cyanosis & congested neck veins.
 - **Palpation** = Shift of trachea & mediastinum to **opposite** site.
 - **Percussion** = Tympanatic resonance.
 - **Auscultation** = ↓ Breath sound.

TREATMENT (Emergency)

I- 1st aid treatment & investigations As before

II- Definitive treatment

- A short wide bore needle is inserted into the pleural cavity through the 2nd intercostal space, then it is replaced by a tube connected to an **under water seal**



III- Urgent thoracotomy

Not used except if indicated.

N.B.: Continuous bubbling of air through the intercostal tube
Denotes the possibility of a broncho-pleural fistula

III- HEMOTHORAX

DEFINITION

Accumulation of **blood** in the pleura

N.B.: Air may coexist
i.e. Hemopneumothorax

AETIOLOGY

1- Traumatic hemothorax :

From injury to

- ① Intercostal vessels.
- ② Internal mammary vessels.
- ③ Intra-thoracic vessels

2. Spontaneous hemothorax :

From

- ① **Tumors** of lung, pleura or mediastinum .
- ② **Ruptured aortic aneurysm.**
- ③ **Blood disease.**

CLINICAL PICTURE

A. History of trauma.

B. Generally Shock & signs of internal hemorrhage

- ① Tachycardia & tachypnea (air hunger)
- ② Hypotension & hypothermia.
- ③ Pale cold skin & oliguria.

C. Locally

- ① Chest pain & dyspnea.
- ② **Local examination**
 - **Inspection** = Unilateral bulge with widely separated ribs & ↓ chest movement.
 - **Palpation** = Shift of trachea & mediastinum to **opposite** site.
 - **Percussion** = Dullness.
 - **Auscultation** = ↓ Breath sound.

COMPLICATIONS

1- Defibrillation :

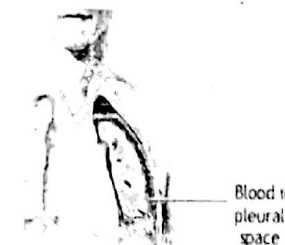
by heart & lung movement so that blood remains fluid for several days.

2- Clotting with deposition of fibrin on pleural surfaces.

3- Organization :

Fibrin → fibrous membrane which encapsulates the lung
interfere with chest wall movements → **Frozen chest**

4- Infection : leads to empyema.



Blood in pleural space



MANAGEMENT

I- 1st aid treatment & investigations As before especially (chest x-ray) which shows

⇒ If the hemothorax is < 500 ml

It will lead only to obligation of costo-phrenic angle.

⇒ If large amounts

It will lead to an opacity rising to the axilla.

⇒ If hemo-pneumothorax :

The pleura shows air (pneumo) & fluid (hemo) level with collapsed lung.



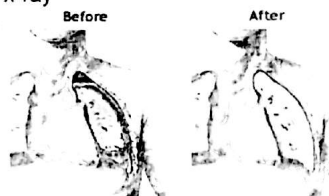
II- Definitive treatment

1- Repeated daily aspiration :

[If 1 -1.5 L blood] Until chest is dry & x-ray shows complete re-expansion of lung.

2- Inter-costal tube :

[If > 1.5 L blood] Inserted at 7th intercostal space mid-axillary line.



III- Urgent thoracotomy

Not used except if indicated.

N.B: Old clotted Hemothorax

1. Liquefaction of the clot by **streptokinase**.
2. Neglected cases : **Decortication** of pleura surgically.

IV- EMPYEMA

A- Acute empyema

DEFINITION

It means **pus** in the pleural cavity which if evacuated, the lung can expand completely.

AETIOLOGY

(Route of infection)

1- Direct :

Open wound, post-traumatic or post-operative

2- Local spread :

From rib, lung, oesophagus or diaphragm.

3- Blood spread :

(Rare) e.g. pyemia.



PATHOLOGY (4 Types)

- 1- **Pneumococcal empyema** : Follows lobar pneumonia (**Metapneumonic**) pus is **thick**, greenish with heavy fibrin deposits
- 2- **Streptococcal empyema** : During bronchopneumonia (**synpneumonic**) pus is **thin**, generalized & localization is late.
- 3- **Staphylococcal empyema** : Spread from staph, pneumonia in children
- 4- **Putrid empyema** : Due to rupture of lung abscess.

CLINICAL PICTURE

A. History of original disease..

B. Generally Toxemia [Fever, Headache, Malaise & Anorexia].

C. Locally

① Chest pain, dyspnea & cyanosis

② Local examination

> Inspection = Unilateral bulge with widely separated ribs & ↓ chest movement.

> Palpation = Shift of trachea & mediastinum to **opposite** site. & ↓ T.V.F.

> Percussion = Dullness.

> Auscultation = ↓ Breath sound.

INVESTIGATIONS

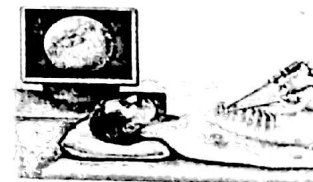
A- Laboratory Leucocytosis

B- Radiological (Plain x-ray chest)

Similar to pleural effusion

C- Instrumental (Aspiration)

To confirm diagnosis & to allow the identification of organism by culture & sensitivity test.



TREATMENT

A- General treatment

Antibiotics, tonics & oxygen.

B- Local treatment Evacuation of pus by

1- Repeated aspiration :

Used with early stages with **thin** pus, children & also in diffused empyema.

2- Closed drainage :

By an intercostal tube connected to under water seal. Used with children with **thick** pus i.e. when aspiration fails.

3- Open drainage : Rib resection

Indicated with chronic empyema or failure of closed drainage

B- Chronic empyema

DEFINITION

It is an empyema in which the lung is **unable** to expand after evacuation of pus

TYPES

I- Open chronic empyema (Chronic sinus)

It is due to inadequate treatment of acute empyema

- ① Inadequate drainage (too early, too late, too high or too low).
- ② Inadequate post-operative care as early removal of the tube.
- ③ Underlying disease e.g. osteomyelitis of ribs or lung abscess

II- Closed chronic Empyema

Encysted empyema or recurrent empyema

III- Broncho-pleural fistula

CLINICAL PICTURE

B. Generally Toxemia [Fever, Headache, Malaise & Anorexia]
with anemia & clubbing of fingers.

C. Locally

- ① Chronic sinus in chest wall discharging pus.
- ② Empyema necessitans (rare)
Which perforates an intercostal space → S.C. abscess.
- ③ Local examination (Progressive fibrosis)
 - Inspection = crowding ribs & scoliosis deformity of spine.
 - Palpation = Shift of trachea & mediastinum to same site.

INVESTIGATIONS

A- Laboratory Leucocytosis

B- Radiological

1- Plain x-ray (chest)

Shows the underlying cause & effect of fibrosis.

2- Lipidol pleurogram :

Shows the size of the cavity & any bronchial communications.

TREATMENT

A- General treatment

Antibiotics, tonics & correct anemia.

B- Local treatment

1- Re-drainage by rib resection :

In a suitable level & proper physiotherapy to allow lung expansion and cures 70 % of cases within 3 months

2- Decortication :

Which is complete excision of the thickened visceral pleura and then the lung is expanded by positive pressure

V- CARDIAC ARREST

DEFINITION

Sudden cessation of effective circulation & respiration

N.B.:

- 1- C.N.S. : Tolerates 3 - 5 minutes of anoxia before irreversible cellular damage occurs.
- 2- If the respiration stops 1st → The circulation will continue for several minutes
but if circulation stops 1st → The respiration stops within 1 minute.



AETIOLOGY

A- Causes of 1st cardiac arrest

- Hypoxia from respiratory obstruction or shock
- Hypothermia.
- Hypokalemia or hyperkalemia
- Acidosis.
- Irritant drugs : Chloroform, adrenaline.
- Myocardial disease : Myocarditis, arrhythmia & infarction

B- Causes of 1st respiratory arrest

- Upper air way obstruction.
- Respiratory failure e.g. overdose of curare drugs.
- C.N.S. depression : head injury, overdose of narcotics.

C- Causes of cardiac & respiratory failure

- Chest injuries.
- Extensive lung collapse.
- Acute pulmonary embolism.

CLINICAL PICTURE

(Cardinal signs of cardiac arrest)

- ① Absent carotid pulse.
- ② Absent gasping respiration.
- ③ Dilated pupils

TREATMENT

1- External cardio- pulmonary resuscitation C.P.R

- The aim :
Is not to restart the heart but to provide an artificial circulation & ventilation

➢ The technique : By closed cardiac massage

- 1- By compression with both hands the lower 1/3 of sternum against the spine at a rate of 60/min while the patient is laid flat on the ground

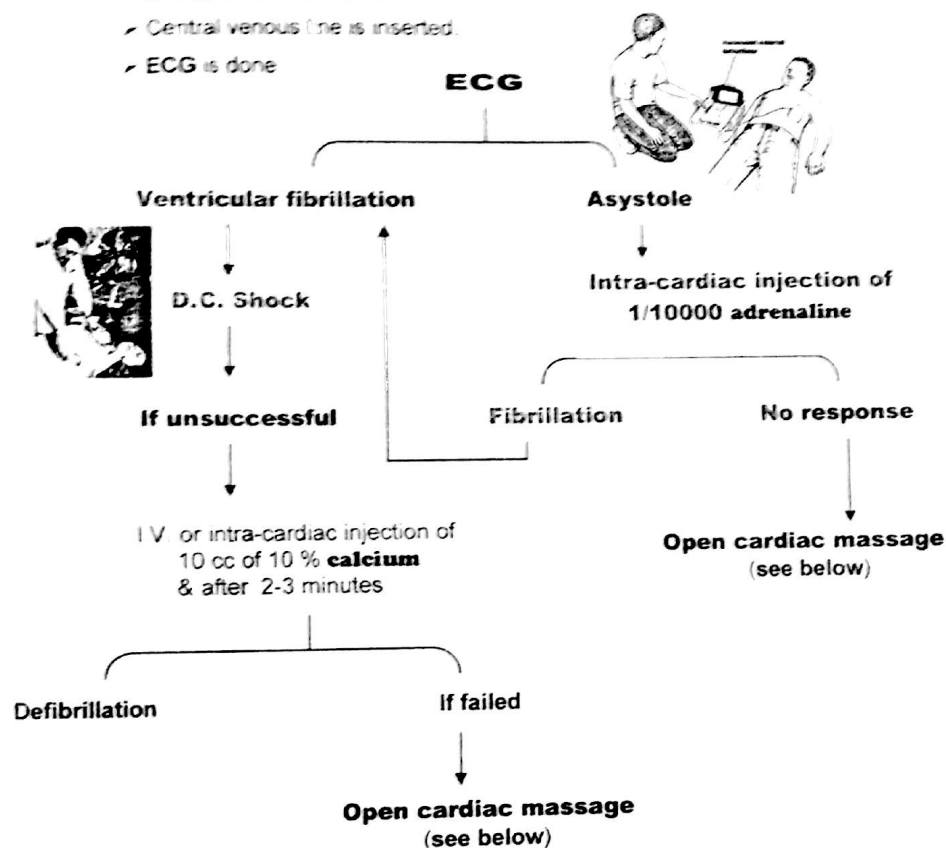
2- Mouth to mouth breathing

at a rate of 15/min while closing the nostrils



2- At hospital

- Mouth to mouth breathing is replaced by endo-tracheal tube & mechanical ventilation
- Central venous line is inserted
- ECG is done



N.B.: Open cardiac massage :

- 1- Chest is opened through the left 5th inter-costal space.
- 2- Massage is done with 2 hands through (opened pericardium)
- 3- Rate : 50 times/min & gently to avoid myocardial damage.

3- Treatment after correction of arrest

- ① Continuous observation & monitoring for possible re-arrest.
- ② Correct any predisposing factor like electrolyte disturbance or hypoxia.
- ③ Give Na HCO₃ to correct metabolic acidosis which develops during arrest

Post-operative pulmonary complications



POSTOPERATIVE PULMONARY COMPLICATIONS

PREDISPOSING FACTORS

A- Pre-operative causes

- 1- Age : Extremes of age are more liable to complications
- 2- Sex : Male > Female due to smoking
- 3- Chronic bronchitis
- 4- Dehydration

B- Operative & post operative causes

1- Anesthesia :

- ① Premeditations with atropine
- ② Trauma to the tracheo-bronchial tree
- ③ Inhalation of blood or vomitus
- ④ Prolonged unconsciousness.

2- Nature of operation :

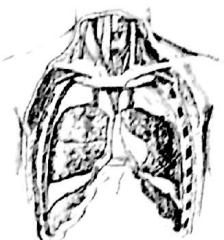
Thoracic & upper abdominal operations

3- Abdominal distention :

e.g. paralytic ileus interfere with movements of the diaphragm

4- Inhibition of cough reflex by ¹³

- ① Pain.
- ② Heavy narcotics.



PATHOPHYSIOLOGY

3 Factors leads to ↑ incidence of post operative lung complications

① After upper abdominal surgery :

The vital capacity of the lungs often drops to as low as 25 % of its pre-operative value.

- ② Elevation & improper movement of diaphragm from pain.
- ③ Smoking or associated chronic bronchitis.

PREVENTION

A- Pre-operative

- 1- Prohibit smoking.
- 2- Correct dehydration.
- 3- breathing exercises.

B- Operative

ANESTHETIST AVOIDS

- 1- Cyanosis
- 2- Excessive atropinization.
- 3- Excessive narcotics.
- 4- Deep anesthesia.
- 5- Vomiting.

SURGEON AVOIDS

- 1- Rough manipulation
- 2- Undue prolongation
- 3- Tight bandage.
- 4- Tight strapping of chest & abdomen

C- Post-operative

- 1- Avoid heavy sedation
- 2- Postural drainage
- 3- Correct dehydration
- 4- Clear secretion
- 5- Early ambulation

TYPES OF COMPLICATIONS

1. Bronchitis.

1. Broncho-pneumonia.

1. Lung collapse (atelectasis) (see page 184)

1. Lung abscess (see page 185)

1. Pulmonary embolism (see page 186)

1. Mendelson's syndrome

- **Causes :** Aspiration of vomitus during induction of anesthesia in patient with full stomach

- **Clinical picture :** Wheezes, cyanosis, tachycardia, tachypnea & hypotension

• Investigation:

X-ray chest shows widespread lung infiltration

• Treatment :

Antibiotics + proper ventilation + bronchial aspiration

7. Adult respiratory distress syndrome [ARDS]

• Causes : due to ¹³

- ① Multisystem trauma.
- ② Severe abdominal or generalized sepsis.
- ③ Extensive burns
- ④ Severe shock from any cause.
- ⑤ Lung injury.

• Defects occur in 3 respiratory processes :

- ① Defective ventilation
- ② Defective perfusion
- ③ Defective diffusion

• Treatment :

The patient should be admitted to an intensive care unit (I.C.U)

1- Treatment of the cause

e.g. correction of shock & eradication of sepsis.

2- Respiratory support

Endo-tracheal tube + mechanical ventilation

LUNG ATELECTASIS

Pulmonary collapse

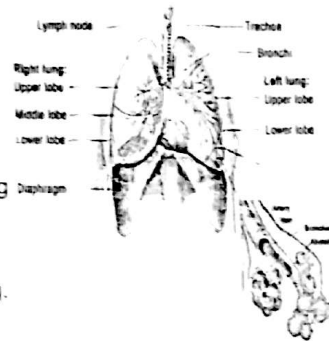
PREDISPOSING FACTORS

As before (see page 182)

PATHOLOGY

Obstruction of bronchus by plug of mucus
→ absorption of air distal to the obstruction
→ deflation & collapse of the affected area which may be %

- ① **Lobular** : Collapse of scattered areas throughout the lung
- ② **Lobar** : Collapse of one lobe
- ③ **massive lung collapse** : Collapse of the whole lung.



CLINICAL PICTURE

Symptoms

- **The onset** is sudden with fever, dyspnea, cyanosis & chest pain.
- **Cough** is slight & sputum is scanty viscid
- The condition may subside after few days with the expectoration of a considerable amount of purulent tenacious mucus

Signs

- General :

Unexplained tachycardia .

- Local :

The affected side of the chest is flattened with dullness on percussion, ↓ breath sound & mediastinal shift towards the side of collapse. As the attack subsides coarse crepitations may appear

INVESTIGATIONS

(Plain x-ray chest)

Shows lung collapse with approximation of the ribs, elevation of the diaphragm & mediastinal shift towards the affected side .

PREVENTION

As before (see page 182 - 183)

TREATMENT

A- Initial measures

- ① Turning the patient from side to side
- ② Percussing the affected side
- ③ Mucolytics & encouraging expectoration .

B- Suction if aeration doesn't occur within 6 - 8 hours .

C- Antibiotics to prevent infection & ambulation from bed

LUNG ABSCESS

AETIOLOGY

- 1- Inhalation of vomitus or F.B during (coma or operation)
- 2- Post-pneumatic or post-traumatic
- 3- Pyemia i.e. pyemic abscess

PATHOLOGY

1- Pneumatic stage

There is area of **consolidation** & if it is superficial there will be overlying acute pleurisy

2- Stage of acute abscess

Suppuration occurs in the consolidated area. The pus will be discharged into a near-by bronchus

3- Stage of chronic abscess

The wall becomes **thick** by **fibrous tissue** & the covering pleura shows thickening & fibrous adhesions.

FATE & COMPLICATIONS

- 1- Rupture into bronchus.
- 2- Spread to (lung, pleura or pericardium)
- 3- Chronic abscess.

CLINICAL PICTURE

A. History

Sudden onset of high fever, pleuritic pain & dry irritative cough.

B. Symptoms

Expectoration of large amounts of offensive & purulent sputum with marked improvement of general condition later on.

C. Signs

- **General** : Early toxemia but improved later on.
- **Local** : Signs of consolidation.

INVESTIGATIONS

A- Laboratory

Sputum analysis

B- Radiological

Plain x-ray (chest)

Shows consolidation or cavitation.

C- Instrumental

Bronchoscopy to detect foreign bodies... etc.

TREATMENT

A- Conservative Antibiotics & postural drainage.

B- External drainage (rarely) done.

C- Lobectomy for chronic abscess or complicated abscess



PULMONARY EMBOLISM

INCIDENCE

- It is the most common cause of unexplained death after operations
- About 2 - 3% of all hospital death.
- The following groups of patients are risky (malignancy, orthopedics & D.V.T)

AETIOLOGY

It is usually a complication from D.V.T

CLINICAL PICTURE

- A. Asymptomatic** With no evidence of DVT in most of cases.
- B. Symptomatic** [4 groups] (8 -10 day post-operative)

1- Fatal pulmonary embolism :

i.e. Main pulmonary artery is obstructed.
Acute chest pain, shock & death within few minutes.

2- Massive types :

i.e. Incomplete obstruction of the main pulmonary artery. Cyanosis, shock & death within hours.

3- Pulmonary infarction :

i.e. Presence of small embolus. Chest pain, dyspnea & signs of consolidation.

4- Recurrent embolism :

i.e. Repeated small infarctions

DD Myocardial infarction & heart failure

INVESTIGATIONS

A- Laboratory

- **Blood gases :** Normal P_{CO_2} & $\downarrow P_{O_2}$

B- Radiological

1- Plain x-ray :

May show vascular markings in obstructed area.

2- Pulmonary angiography :

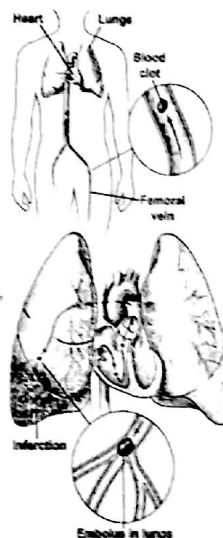
May show filling defect inside the artery or obstructed artery.

3- Doppler U/S & duplex :

May detect occult D.V.T in lower limb.

C- Instrumental

- **ECG** for exclusion of myocardial infarction



TREATMENT

A- Conservative

- 1- **Anticoagulants & Morphia** (to $\downarrow$ pain)
- 2- **Antibiotics & Atropine** (to $\downarrow$ bronchial spasm)
- 3- Oxygen inhalation.

B- Fibrinolytic therapy

Injection of **streptokinase** or **urokinase** through a catheter in pulmonary artery.

C- Pulmonary embolectomy

Surgical embolectomy if all mentioned above are failed

D- Venous thrombectomy

For residual clot in the lower limb

E- Prevention of recurrent embolism

Through vena-caval filter.

BRONCHOGENIC CARCINOMA

INCIDENCE

- There is increasing incidence in last 30 years.
- **Age :** 50 - 70 years
- **Sex :** male > female

PREDISPOSING FACTORS

- ① Excessive smoking
- ② Exposure to irradiation.
- ③ Bronchial adenoma

PATHOLOGY

Site • Central of hilum :

Arising in main bronchus & invades the mediastinum

• **Peripheral hilum :**

Arising in small bronchus & invades the pleura

• **Pancost tumor :**

Arising at apex of lung & invades sympathetic trunk.

N/E • Fungating, malignant ulcer, nodular or infiltrating mass

M/E • Squamous cell carcinoma 60 %

• Anaplastic 30 %

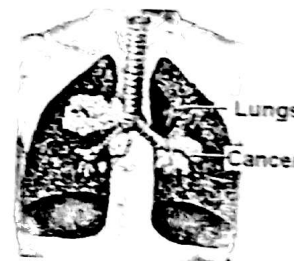
• Adenocarcinoma 10 %

SPREAD

Direct To other parts of lung, pleura, mediastinum ... etc.

Lymphatic To hilar L.Ns $\rightarrow$ para-tracheal L.Ns $\rightarrow$ cervical L.Ns

Blood Bone, liver & brain



CLINICAL PICTURE

A. General symptoms :

Malaise, anorexia & loss of weight

B. Broncho-pulmonary presentations

- Asymptomatic : discovered accidentally.
- Symptomatic : Hemoptysis, bronchial obstructions, pneumonia

C. Pleural presentations :

Malignant effusion, serous transudate, chylous effusion, empyema or dry pleurisy.

D. Mediastinal presentations :

Cough, dyspnea, chest pain or hemoptysis.

E. Metastatic presentations :

- Liver : pain at Rt. hypochondrium & jaundice
- Bone : bony aches & pathological fractures .
- Brain : blurring vision, vomiting ...etc.



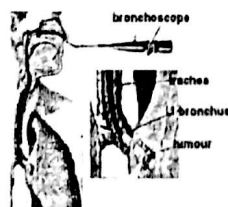
INVESTIGATIONS

A- Radiological

- Plain x-ray : Shows coin shadow
- CT scan : Diagnostic

B- Instrumental

- Bronchoscopy & biopsy
- Mediastinoscopy
- Needle biopsy



TREATMENT

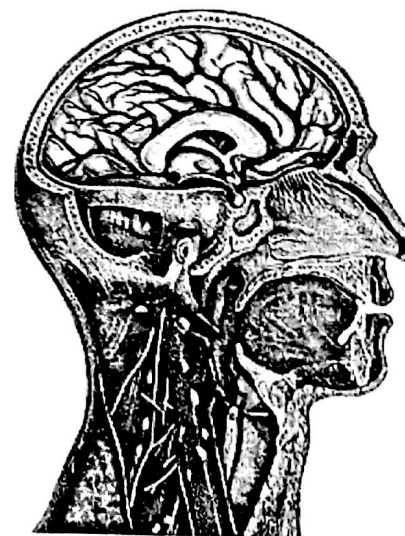
A- Operable

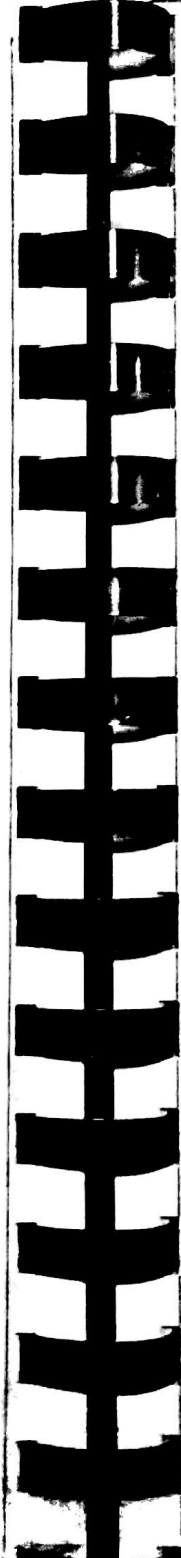
Lobectomy or radical pneumonectomy .

B- Inoperable

Palliative resection + chemotherapy + radiotherapy.

NEUROSURGERY





Head injuries

HEAD INJURIES

CLASSIFICATIONS

I- SCALP injuries

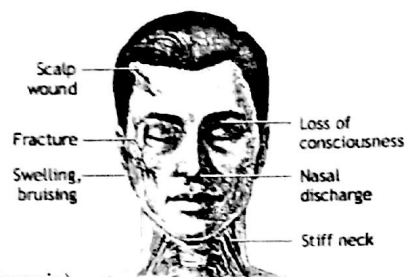
II- Skull fractures :

- Fractures of skull vault
- Fractures of skull base

III- Intra-cranial injuries

IV- Acute extra-dural hematoma.

V- Sub- dural hematoma (acute & chronic)



I- SCALP INJURY

LAYERS OF THE SCALP

- 1- Skin.
- 2- Connective tissue.
- 3- Aponeurosis (Galea aponeurotica).
- 4- Loose areolar tissue.
- 5- Pericranium (periosteum)



WOUNDS OF THE SCALP

Characterized by :

- ① **Bleeding** is very excessive → shock.
- ② **Healing** is very rapid.
- ③ **If infection occurs** leads to ☞
Cellulites, brain abscess or sinus thrombosis.



TYPES

Subcutaneous hematoma	Subgaleal hematoma	Subperiosteal hematoma (Chephal hematoma)
Hematoma is confined to the dense S.C layer	It occupies the loose areolar tissue under the galea aponeurotica.	Hematoma is under the periosteum
Small, painful and moves with the scalp over the skull.	Large, soft fluctuating swelling reaching anteriorly to the supra-orbital ridges, posteriorly to the nuchal lines, & laterally to the temporal lines.	The hematoma is limited by the suture lines to the underlying bone usually the parietal.

TREATMENT

A. Treatment of open wounds

- 1- If there is possibility of a skull fracture :
Plain skull x-ray is performed.
- 2- Closure is in 2 layers :
 - a- Galea to galea by absorbable sutures.
 - b- Skin to skin by non-absorbable sutures.



B. Treatment of hematoma

- 1- Subcutaneous hematoma :
It will resolve spontaneously.
 - 2- Sub-galeal hematoma
 - 3- Subperiosteal hematoma
- Aspiration & pressure bandage.



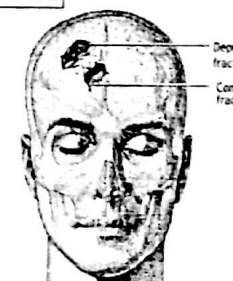
II- SKULL FRACTURES

1- Fractures of the skull vault

AETIOLOGY

(Trauma) usually direct by 3 mechanism

- ① Local Indentation : by object e.g. hammer.
- ② Compression of skull e.g. car accident.
- ③ Missile injuries.



PATHOLOGICAL TYPES

- 1- Fissured fracture
 - (a) Simple : without scalp lacerations.
 - (b) Compound : with scalp lacerations
- 2- Depressed fracture
 - (a) Simple : Without scalp lacerations.
 - (b) Compound : with scalp lacerations.



N.B.: Open fractures :

i.e. compound (fissured or depressed) fractures carry the risk of ☞

- ① Escape of intra-cranial content (blood or CSF).
- ② Introducing foreign bodies to brain.
- ③ Introducing infection as meningitis or encephalitis.

CLINICAL PICTURE

1- Fissured fracture

(a) Simple :

- ① Hematoma over it.
- ② Fissure can not be seen or felt through intact scalp

(b) Compound :

- ① Escape of blood.
- ② Fissure can be seen & felt through lacerated scalp.

N.B.: D.D from suture lines which present in anatomical site & its zigzag shape

2- Depressed fracture

(a) Simple :

- ① Hematoma over it.
- ② Depression can be seen or felt through intact scalp.

(b) Compound :

- ① Escape of blood.
- ② Depression can be seen or felt through lacerated scalp.

COMPLICATIONS

1- Fissured fracture usually nothing

2- Depressed fracture

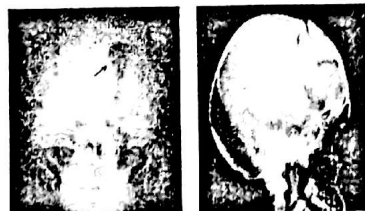
- ① Dural tear.
- ② Infection as meningitis.
- ③ Epilepsy.
- ④ Cosmetic deformity.
- ⑤ Severe bleeding from one of the venous sinuses.
- ⑥ Associated brain injury.

INVESTIGATIONS

1- **Skull (x-ray)** shows type, site, size & shape of fracture

2- **C.T scan**

3- **MRI**



TREATMENT

1. Fissured fracture

(a) **Simple** : Left under observation if no neurological damage

(b) **Compound** : Exploration by small burr hole if suspecting an extra-dural hematoma.

2. Depressed fracture

(a) **Simple**: Conservative treatment

- Unless**
- ① Large depressed segment > 1 inch.
 - ② Depressed segment compresses an important area.
 - ③ Depressed segment causing cosmetic deformity.

(b) **Compound** : Exploration by burr hole in surrounding skull bones + elevation of depressed bone by bone elevator + deal with any intra-cranial injury.

2- Fractures of the skull base

AETIOLOGY (Trauma)

A- Direct trauma

By penetrating sharp objects or bullets through mouth.

B- Indirect trauma

1- **To vault** : Produces fracture base by bursting.

2- **To face** : Maxilla transmits force to **anterior** cranial fossa

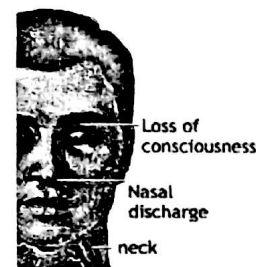
3- **To chin** : Mandibular condyles transmit force to **middle** cranial fossa

4- **To spine** : Fall on the heels or buttocks pushes the spine against **posterior** cranial fossa.



PATHOLOGY

- > Fracture base is often compound.
- > There are 3 groups of associated lesions :-
 - 1- Escape of blood, C.S.F., brain matter through the openings (nose & ear)
 - 2- Associated cranial nerve injuries.
 - 3- Associated brain injury from trauma.



CLINICAL PICTURE

I- Anterior Cranial fossa

1- Escape of intracranial contents :

- Blood → Epistaxis + black eye.
- C.S.F → salty taste + C.S.F rhinorrhea.
- Brain matter → may escape from the nose.

	SUBCONJUNCTIVAL HEMORRHAGE FROM LOCAL TRAUMA	SUBCONJUNCTIVAL HEMORRHAGE FROM FRACTURE BASE
1. TRAUMA	To the eye	To the head
2. CONSCIOUSNESS	Not affected	May be loss of consciousness
3. ONSET	Immediate	Delayed
4. SHAPE	Triangular with base to cornea 	Triangular with apex to cornea 
5. POST LIMIT	Definite	Can not be seen
6. COLOUR	Bright red	Dark red

2- Cranial nerve injury :

Olfactory, optic, oculomotor, ophthalmic or abducent

3- Associated brain injury.

II- Middle cranial fossa

1- Escape of intra-cranial contents :

- Blood → Epistaxis if fracture involves nasal sinuses ± bleeding per ear if torn tympanic membrane.
- C.S.F → From the ear



2- Cranial nerve injury :

Mandibular & maxillary division of the 5th nerve & the 8th nerve may be injured.

3- Associated brain injury.

III- Posterior cranial fossa

1- Escape of intra-cranial contents :

- Blood may occur in occipital region → Occipital hematoma.

2- Cranial nerve injury

9th, 10th, 11th in jugular foramen. 12th is protected by strong condyloid process.

3- Associated brain injury.

INVESTIGATIONS

1- C.T scan

2- MRI

N.B: X-ray doesn't show the fracture

TREATMENT

1- Prevention of infection

By strong antibiotics + plugging the ear with sterile cotton but avoid irrigation.

2- Control of C.S.F leakage

- ⇒ Patient is nursed in a semi-sitting position.
- ⇒ Warn the patient not to blow the nose.
- ⇒ If discharge persists after 10 days → should be surgically repaired.

3- Treatment of associated brain injuries

III- INTRA-CRANIAL INJURIES

AETIOLOGY [Trauma]

- 1- OPEN INJURIES : Sharp objects or bullets.
- 2- CLOSED INJURIES.



MECHANISM OF INJURY

The main factors are the displacement & distortion of cerebral tissues.

FACTORS THAT AFFECT SEVERITY OF CEREBRAL INJURY

1. Distortion of the brain :
2. Mobility of the brain in relation to the skull & membranes.
3. Configuration of the interior of the skull :
Smooth areas of the skull will cause less damage.
4. Age of the patient :
A young patient will have a better chance of recovery

PATHOLOGY

A- 1st pathological sequelae

- Cerebral concussion :

There is slight brain functions distortion but **without** any organic damage

- Cerebral contusion & laceration :

There are areas of bruising & edema of the cortical gyri producing → prolonged period of unconsciousness + physical signs of focal neurological damage

B- 2nd pathological sequelae

- ① Brain edema : Clinically simulates the picture of brain compression without focal manifestations.
- ② Intra-cranial hemorrhage : Which may be extra-dural, sub-dural or Intra-cerebral.
- ③ Vascular changes with ischemic necrosis.
- ④ Coning : Herniation of the contents due to ↑ Intra-cranial pressure as foramen magnum herniation.
- ⑤ Brain stem injury, infection & C.S.F. rhinorrhea

2- EXTRA-CRANIAL FACTORS THAT AFFECT THE CEREBRAL INJURY

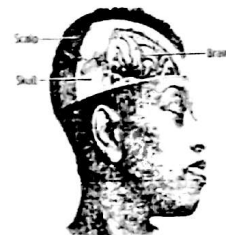
1. **Respiration** : Hypoxia & ↑ PCO₂ can aggravate the development of severe brain edema & venous congestion
2. **Blood volume & blood pressure** : Hypovolemia may lead to irreversible cerebral ischemic damage.
3. **Fluids** : Intravenous infusion of hypotonic fluids leads to ↑ brain edema
4. **Temperature** : A rise in body temperature will cause a further deterioration in neurological state due to ↑ metabolic rate.

IV- ACUTE EXTRA-DURAL HEMATOMA

Middle meningeal artery or vein injury

AETIOLOGY

- Usually due to a **trivial trauma** applied to the side of the skull causing a fracture of temporal or parietal bone.
- The dura is driven inwards & tearing of the anterior or posterior branches of **middle meningeal artery** or vein leading to accumulation of blood in extra-dura space.



PATHOLOGY

The blood escapes in 3 directions :

1. Outwards through the fracture → boggy swelling under temporalis muscle.
2. Upwards over the parietal region.
3. Downwards into the middle cranial fossa.

N.B.: An extra-dural hematoma can occur without a skull fracture especially in children as they have an elastic skull

CLINICAL PICTURE 3 stages :

1- Stage of concussion

- Sudden loss of consciousness, relaxed muscles & closed eyes.
- Rapid weak pulse with slow & shallow respiration.
- Subnormal temperature & hypotension.
- Pale, cold & clammy skin.
- Reflexes are lost & sphincters are relaxed.

2- Stage of lucid interval

- It is a time needed for accumulation of hematoma enough to produce compression.

N.B.1- The patient may pass from concussion to compression with brief lucid interval i.e. missed.

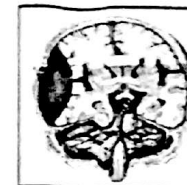
2- If the source of bleeding is venous
The lucid interval will prolonged.

3- Stage of compression

- **Early (irritation) :**
Headache, irritability, confusion & drowsiness with convulsion.
- **Late (depression) .:**
Semi-coma or coma with hemiplegia.

N.B.: Signs of lateralization = side of decompression

- Side of scalp hematoma.
- Side of skull fracture in x-ray.
- Side of initial constriction then dilatation of pupil.
- Opposite side of convulsions.
- Finally, Terminal compression
= decerebrate rigidity → death.

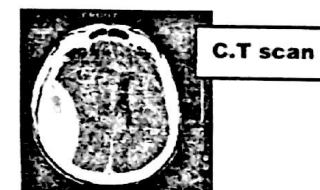


DIFFERENTIAL DIAGNOSIS

ACUTE EXTRADURAL HEMATOMA	ACUTE SUBDURAL HEMATOMA
(1) Usually mild trauma	(1) Severe trauma.
(2) Usually mild brain damage	(2) Severe brain damage
(3) Lucid interval may be present	(3) Persistent loss of consciousness without lucid interval.
(4) The hematoma is usually unilateral	(4) Commonly bilateral & extensive.

INVESTIGATIONS

- 1- C.T scan
- 2- MRI
- 3- Carotid angiography

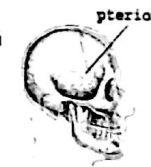


TREATMENT

See management of cerebral injuries

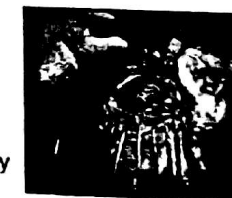
⇒ **Urgent exploration** to evacuate the hematoma & deal with the bleeders before late compression occur.

⇒ **Site of exploration :** is indicated by signs of lateralization (usually centered at **pterion** = 4 cm above & behind external auditory meatus).



⇒ If middle meningeal artery :

- At foramen spinosum :
Bleeding control by a plug.
- Within the dura :
Under running suture.
- At bony tunnel :
Bone wax or crushing the bony canal over the vessel.



⇒ If venous sinuses :

- Suture the tear in the sinus wall

V- SUBDURAL HEMATOMA

1- Acute sub-dural hematoma

AETIOLOGY

It is due to **severe** blow to the skull

PATHOLOGY

It crosses the subdural space to reach the fixed subdural venous sinuses.

CLINICAL PICTURE & D.D

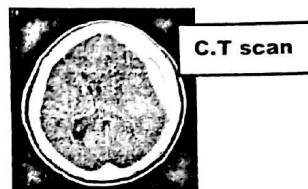
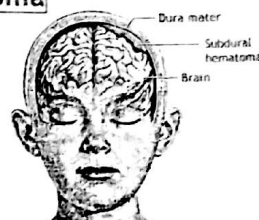
See DD from acute extradural hematoma

INVESTIGATIONS

- 1- C.T scan
- 2- MRI
- 3- Carotid angiography

TREATMENT

(Usually serious brain damage with mortality rate 50 %)
The dura mater is opened in cruciate fashion to allow rapid decompression of the brain.



2- Chronic sub-dural hematoma

AETIOLOGY

2nd to a slight blow to head with elderly persons & alcoholics.

PATHOLOGY

Sudden displacement of the brain causes rupture of superior cerebral veins as they pass to the venous sinuses.

N.B. : This hematoma is bilateral in 50 % of cases

CLINICAL PICTURE

(The Interval between trauma & symptoms varies between weeks to months)

- **Symptoms** are vague & consists of chronic headache, mental apathy.
- **Physical signs** may be absent.

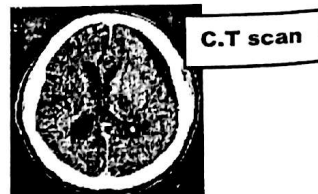
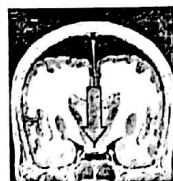
N.B. : The condition may be diagnosed as → psychosis or cerebrovascular accident.

INVESTIGATIONS

- 1- C.T scan
- 2- MRI
- 3- Carotid angiography

TREATMENT

Evacuation through burr holes.
If the blood is thick, bi-frontal burr holes are done & the subdural space is washed with saline.



Management of cerebral injuries

Management of closed head injuries

The management of patient with head (cerebral) injuries :
Must follow a planned program as follows :

1. Dealing with the life saving priorities.
2. Initial examination.
3. Performance of the necessary investigations.
4. Continuing care & observations.
5. Possible need for surgery to evacuate an intracranial hematoma.



1. Dealing with life saving priorities (A.B.C)

A. Air way

- **Air way obstruction may result from :**

- ① Inhaled blood, C.S.F, vomitus, mucus.
- ② Falling back of tongue.
- ③ Retained secretions.

- **Clear air way is maintained by :**

- ① Pulling on a fallen tongue + oral airway
- ② Regular aspiration of secretions.
- ③ Endotracheal tube or even urgent tracheostomy may be needed.

B. Breathing

Take care that difficult breathing causes brain congestion which lead to :

- ① Increased C.S.F.
- ② Increased bleeding.
- ③ Brain oedema.

C. Circulation

Treatment of shock if present.

2. Initial examination

We must to examine

- 1- **Vital signs** : pulse, B.P & respiratory rate.
- 2- **Chest & abdomen** for associated injuries.
- 3- **Scalp** for any scalp wound or hematoma.
- 4- **Skull** for any fracture.
- 5- **Pupils & limbs**

Then Glasgow Coma Scale (G.C.S)

Which based on ↗

(1) Eye opening		(2) Best verbal response		(3) Best motor response	
Spontaneous	4	Oriented	5	Obeys command	6
To verbal command	3	Confused	4	Localizes pain	5
To pain	2	Inappropriate words	3	Flexion withdrawal	4
None	1	Incomprehensible sounds	2	Abnormal flexion	3
		None	1	Abnormal extension	2
				None	1

Finally : Total points are added, the higher the score, the better the prognosis [A score < 8] = poor prognosis

3- Performance of the necessary investigations

1- Plain skull x-ray :

- ① Can demonstrate the site & type of skull fracture
- ② Can visualize foreign bodies.

2- CT scan It can diagnose :

- ① Fractures of the vault or base of skull.
- ② Brain contusion or laceration.
- ③ Brain edema.
- ④ Intracranial hematomas.

4- Continuing care & observations

1- Posture :

- ① Unconscious : nursed on his side.
- ② Conscious : semi-sitting to ↓ brain congestion & C.S.F. leak.

2- Pyrexia : Controlled by cold fomentation + antipyretics.

3- Breathing : Proper clear air way + oxygenation by ↗

- ① Oxygen mask.
- ② Tracheostomy.
- ③ Endotracheal tube + mechanical ventilation.

4- Bladder : Foley's catheter is fixed.

5- Bowel :

- ① Ryle's tube : for feeding in comatosed patient.
- ② Rectal enema : to evacuate the large bowel in comatosed patient.

6- Back :

Bed sores are prevented by changing the position of comatosed patient every 2 hours or using air mattress

5- Possible need for surgery

To evacuate an intra-cranial hematoma (see before)

Brain abscess, Hydrocephalus & Brain tumors

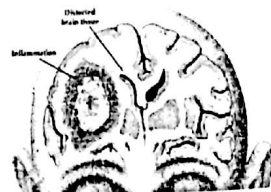
I- INTRA-CRANIAL ABSCESS

Brain abscess

AETIOLOGY

Routes of infection

- ① Local extension from adjacent infection
e.g. Otitis media & sinusitis.
- ② Direct inoculation e.g. trauma.
- ③ Hematogenous.



PATHOLOGY

The abscess passes into 3 stages :

- ① **Acute stage** : Acute encephalitis with swelling & edema of the affected part.
No pus is formed at this stage.
- ② **Subacute stage** : Pus is formed & it gets localized.
- ③ **Chronic stage** : Thick wall with pus inside.

CLINICAL PICTURE

A. Acute abscess will present with

- a. Picture of increased intracranial tension.
- b. Picture of infection & toxemia.
- c. Progressive headache resist to analgesics.

B. Chronic abscess will present with

- a. Picture of increased intracranial tension.
- b. Focal signs of brain lesions according to the lobe affected.

INVESTIGATIONS

- 1- C.T scan
- 2- MRI

TREATMENT

A- Medical treatment

- 1- Antibiotics.
- 2- Corticosteroids : reduce cerebral edema.

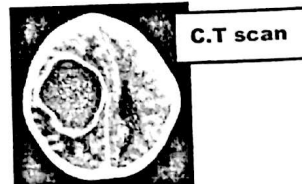
B- Surgical treatment

1- Factors that favour aspiration :

- ① Multiple abscesses.
- ② Deeply seated abscesses.
- ③ At critical site e.g. motor or speech area.

2- Factors that favour excision :

- ① Multi-locular abscesses.
- ② Superficial seated abscess.
- ③ Presence of foreign bodies.



II- HYDROCEPHALUS

DEFINITION

It is an increase in the volume & pressure of C.S.F
i.e. Watery head.

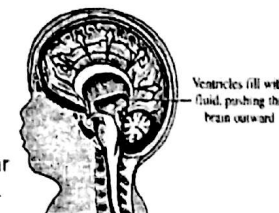
CLASSIFICATION

A- Non-communicating

It results from lesions that obstruct the ventricular system either at the aqueduct or basal foramina.

B- Communicating

It results from lesions that obstruct the subarachnoid space.



AETIOLOGY

1. Aqueduct occlusion :

This is the result of true aqueduct stenosis.

2. Arnold Chiari malformation :

Hydrocephalus is associated with myelomeningocele.

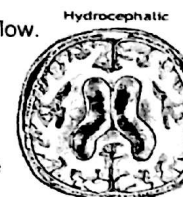
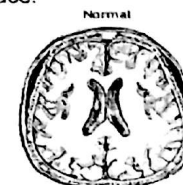
3. Dandy-Walker syndrome :

A cystic dilatation of the fourth ventricle obstructs CSF flow.

4. Cerebral malformations as hydrancephaly.

5. Arachnoid cysts that obstruct the CSF flow.

6. Neoplasms that are mainly situated in fourth ventricle



DIAGNOSIS

A- In children

- Symptoms : The mother says that the head of her baby is large & increasing in size.
- Signs : Circumference of Head > Normal.

B- In adult

- Acute type : Headache, vomiting, drowsiness & papilloedema.
- Chronic type : Memory loss, urinary incontinence & disturbed gait.

INVESTIGATIONS

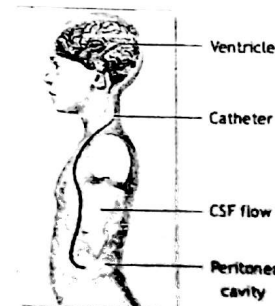
- 1- Plain x-ray
- 2- C.T scan
- 3- MRI

TREATMENT

Shunting procedures

Extra-cranial shunt :

- e.g. (1) Ventriculo-peritoneal shunt.
(2) Ventriculo-atreal shunt.



III- INTRA-CRANIAL TUMORS

DEFINITION

Intra-cranial tumors are refers to all neoplasms arising from the skull, meninges, blood vessels, pituitary, cranial nerves & brain tissue

INCIDENCE

50 % of Brain tumors are metastases
20 % of all childhood neoplasms.

AETIOLOGY

Brain tumors are a result of **genetic alteration** which is mainly spontaneous however radiation, chemical & viral agents have been accused.

PATHOLOGY

Glial tissue	Glioma
Meninges	Meningioma
Nerves	Neuronal (e.g. Acoustic neuroma)
Blood vessels	Hemangioblastoma
Embryonic	Medulloblastoma
Pituitary gland	Pituitary adenoma - Non functioning - Functioning
Mal-development	Cranio-pharyngioma

CLINICAL PICTURE

A- Symptoms due to ↑ ICP

• Headache.

• Vomiting :

- With or without nausea (projectile)
- Not related to meals

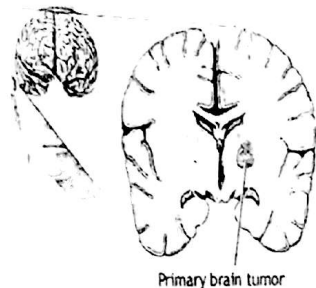
• Blurring of vision

due to papilloedema & later optic atrophy

B- Focal effects

RELATED TO THE SITE & NATURE OF THE TUMOR

- **Hemiplegia** in tumors of the motor areas
- **Aphasia** in tumors of speech area
- **Hormonal disturbance** in functioning pituitary tumors



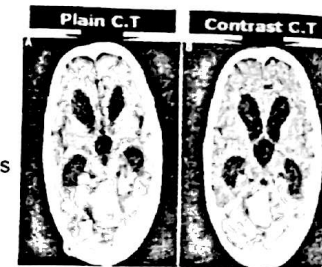
Primary brain tumor



INVESTIGATIONS

1- CT scan without & with contrast

- ① Detects the site & size of the tumor
- ② Detects the presence of edema
- ③ Detects midline shift
- ④ Detects the presence of hydrocephalus
- ⑤ Points to the pathology as →
Solid, cystic, calcification....etc.



2- MRI

Becomes the **best tool in diagnosis** especially when used together with CT scan

3- Less used investigations

As plain x-ray or angiography

TREATMENT

A- Medical treatment

1- Dehydration measures (diuretics) as mannitol to control edema & to ↓ I.C.P

2. Steroids in treatment of pre & post-operative edema

3. Chemotherapy in specific tumors.

B- Surgical treatment

1. Craniotomy through bone flaps

2. Craniectomy by bone nibbler used in regions covered by muscles e.g. Sub-occipital region

3. Ventriculo-peritoneal shunt may be needed if associated hydrocephalus

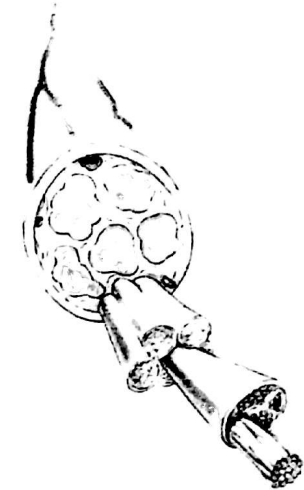
4. Endoscopic surgery for intra-ventricular tumors



C- Radiation

Radiotherapy for most malignant tumors

PERIPHERAL NERVE INJURY



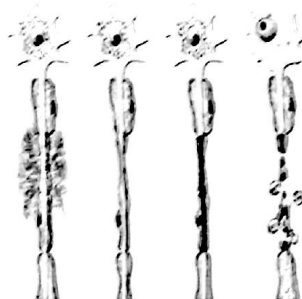
Nerve injury

PERIPHERAL NERVE INJURY

INTRODUCTION

AETIOLOGY (Trauma)

- A- Open injuries** as :-
Open wound, bullets, deep burns ... etc.
- B- Closed injuries** as :-
① Fracture & dislocation.
② Contusions by a direct blow
③ Compression by tourniquet
④ Birth injuries.
⑤ Ischemia from injuries of main vessels.



PATHOLOGY (Types)

- A- Neuropraxia**
Temporary loss of nerve function with **no** changes in nerve axons or sheaths so it has the **best** prognosis.
- B- Axontmesis**
It is due to interruption of the axon with **intact** neurolemmal sheaths so it has a **good** prognosis.
- C- Neurotmesis**
It is due to **interruption** of both axon & neurolemmal sheaths so it has a **bad** prognosis.

CLINICAL PICTURE

- 1- Injury of motor part
 - 1- **Deformity** (malposition).
 - 2- **Paralysis** (loss of function).
 - 3- **Muscle atrophy & wasting**
- 2- Injury of sensory part
 - 1- **Loss of superficial sensation** as pain, temp & touch.
 - 2- **Loss of deep sensation** as sense of position & movement.
- 3- Injury of autonomic part
 - 1- **Vasomotor changes** as redness of skin.
 - 2- **Sudomotor changes** as loss of sweating.
- 4- Trophic changes.
As loss of hair, brittle fissured nail & dry scaly skin.

DIAGNOSIS OF NERVE INJURY

A- Clinical examination
History of trauma & its type

B- Tests

(A) NERVE CONDUCTION TEST (N.C.T) :

- **Neuropraxia** conduct electrical impulse
- **Axontmesis & neurotmesis** can't conduct it



(B) QUINIZARINE POWDER TEST :

- = **Sweating test** to detect anhidrosis
- Put the **white** powder at skin affected then observe the change of its color.
- If remain **white** it means **anhidrosis**
- If changed to be **pink** it means **sweating**.



(C) ELECTROMYOGRAPHY :

- Detect response of denervated muscles to electric stimulation.
- **Fibrosed** muscles shows **no** response

N.B.: Plain x-ray :

May detect any foreign bodies or fractures.

(D) TINEL'S PERCUSSION :

- To detect the rate of nerve regeneration.
- The course of the nerve is percussed from below, upwards.
- **Tingling sensation** is experienced when the level of regeneration is reached.



TREATMENT

A- Conservative treatment

INDICATIONS

- 1- **CLOSED INJURIES** as :-
neuroaprexia & axontmesis.
- 2- **BEFORE** or **AFTER** nerve repair to prevent deformity.

CONSISTS OF :-

- 1- **SPLINTAGE** to prevent over-stretching of paralyzed muscles.
- 2- **ACTIVE & PASSIVE** exercise to prevent stiffness.
- 3- **PROTECTION** of the skin.

B- Operative treatment

INDICATIONS

1- ALL OPEN INJURIES

2- CLOSED INJURIES after failure of conservative treatment.

CONSIST OF

1- Nerve repair :

- 1st nerve suture (Immediate suture of divided nerve) with clean & incised wounds present within 6 hours of injury.
- 2nd nerve suture (3 - 4 weeks later)
If any gap is present it should be overcome by the followings :
 - ① Dividing unimportant branches to gain length.
 - ② Nerve transposition e.g. bringing radial nerve in front of humerus or ulnar nerve in front of medial epicondyle.
 - ③ Bone shortening, which is done only in radial nerve with un-united fracture humerus.
 - ④ Nerve grafting by small cutaneous nerve as sural nerve in the leg.

N.B. : Tapes of nerve repair :

A- Epineural : The suture passes through the nerve sheath

B- Inter-fascicular the suture passes through the nerve bundles



2- Orthopedics treatment :

- It is used when one fail to make the nerve to recover
- It consists of
 - ① Arthrodesis : Fixation of the Joint.
 - ② Tendon transplantation

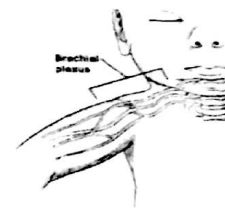
PROGNOSIS

- 1- Neuropraxia : It is the best prognosis.
- 2- Motor or sensory nerve : Better prognosis than mixed nerves.
- 3- Nerve supply bulky muscle : Better prognosis than which supply fine muscles.
- 4- Good apposition of the cut ends of the nerve = Better prognosis
- 5- Asepsis : Because sepsis interfere with nerve generation due to fibrosis & loss of nerve tissue.

I- BRACHIAL PLEXUS INJURIES

AETIOLOGY

- A- Open injuries as $\rightarrow$
Open wound, bullets, deep burns ... etc.
- B- Closed injuries as $\rightarrow$
 - ① Birth traction injury.
 - ② Fracture clavicle.
 - ③ Hyperabduction of arm under anesthesia.



CLINICAL PICTURE & TYPES

1- Complete brachial plexus injury (Rare)

- Motor : Paralysis of all the upper limb muscles.
- Sensory : Anesthesia of whole the upper limb
Except ① Medial side of arm which is supplied by intercosto-brachial nerve (T_2).
② Over the deltoid which is supplied by supra-clavicular nerve (C_3 & C_4).
- Horner's syndrome :
(Ptosis, myosis, anhydrosis, enophthalmos)

2- Upper trunk injury (Erb-Duchenne paralysis) (C_5 & C_6)

- Motor : - Paralysis of shoulder abductors as (deltoid & supra-spinatus), external rotators as (infra-spinatus), forearm flexors & supinators.
- So the limb hangs by the side being adducted, internally rotated, extended, pronated with flexed wrist (Policeman's tip position)
- Sensory : No effect if C_5 alone is injured.
If C_6 also suffers, there's anesthesia over deltoid.



3- Lower trunk injury (Klumpke's paralysis) (C_8 & T_1)

- Motor : Paralysis of flexors of wrist & fingers (C_8) & intrinsic muscles of hand (T_1) producing (complete claw hand)
- Sensory : Anesthesia along the inner side of forearm & inner $1\frac{1}{2}$ finger (ulnar distribution).
- Horner's syndrome :
(Ptosis, myosis, anhydrosis, enophthalmos)



II- ULNAR NERVE INJURY

The nerve is either injured at the wrist or elbow

1- Injury at the wrist

AETIOLOGY

- ① Cut wrist
- ② Colle's fracture.
- ③ Carpal tunnel syndrome.



CLINICAL PICTURE

I- Inspection

1- Deformity : (Partial) ulnar claw hand due to paralysis of med, 2 lumbricals.

2- Wasting :

- a. Adductor pollicis
- b. Intrososseous space
- c. Hypothenar eminence
 - Abductor digiti minimi.
 - Flexor digiti minimi.
 - Opponens digiti minimi.



3- Vasomotor or sudomotor changes

4- Trophic skin changes

5- Scar at wrist joint

} Minimal

II- Palpation

6- Skin sensation :

Loss of sensation at palmar surface of medial 1.5 finger only

2- Injury at the elbow

AETIOLOGY

- ① Fracture & dislocation of elbow.
- ② Wounds at the elbow.
- ③ Stretching & friction of nerve against the medial epicondyle as in cubitus valgus deformity.

CLINICAL PICTURE

All of the above +

I- Inspection

1- Deformity : Decreased because of extension of distal I/P joint
- Because of paralyzed medial 1/2 of flexor digitorum profundus.
i.e. **Ulnar paradox**

- Also there is **radial deviation** because of paralyzed flexor carpi ulnaris

2- Wasting : At medial side of ulna because wasting of flexor carpi ulnaris & medial 1/2 of flexor digitorum profundus.

3- Vasomotor or sudomotor changes } **Marked**

4- Trophic skin changes

5- Scar : At forearm or cubital fossa.

II- Palpation

6- Skin sensation :

Loss of sensation at palmar & dorsal surface of medial 1.5 finger & loss at palmar & dorsal surface of medial aspect of the hand



DIAGNOSIS

As general +

Special tests

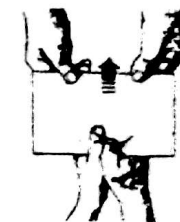
(A) CARD TEST :

- Due to paralysis of interossei which adduct the fingers.
- The patient can't hold a card between his extended fingers.



(B) FROMENT TEST :

- Due to paralysis of adductor pollicis
- The patient is asked to grasp a paper between his thumb & sides of index fingers.
- The terminal phalanx of the affected thumb is flexed to hold the paper by the flexor pollicis longus which supplied by median nerve.



TREATMENT

As general

PROGNOSIS

As general

III- MEDIAN NERVE INJURY

The nerve is either injured at the wrist or forearm

1- Injury at the wrist

AETIOLOGY

- ① DLT wrist
- ② Colle's fracture.
- ③ Carpal tunnel syndrome

CLINICAL PICTURE

I- Inspection

1- Deformity : (Ape hand)

due to paralysis of **abductor pollicis brevis** and contraction of **adductor pollicis** which supplied by ulnar nerve.

2- Wasting :

- a. Abductor pollicis brevis.
- b. Flexor pollicis brevis.
- c. Opponens pollicis.

3- Vasomotor or sudomotor changes

4- Trophic skin changes

5- Scar : At wrist joint

} Minimal

II- Palpation

6- Skin sensation :

Loss of sensation at palmar surface of lateral 3.5 finger only



2- Injury at the forearm

AETIOLOGY

- ① Fracture & dislocation of elbow.
- ② Wounds at the elbow.

CLINICAL PICTURE

All of the above +

I- Inspection

- 1- Deformity : The same but there is **ulnar deviation** because of paralysis of **flexor carpi radialis**.

- 2- Wasting : At flexor surface of forearm because of wasting of their muscles

- 3- Vasomotor or sudomotor changes
 - 4- Trophic skin changes
- } Marked

- 5- Scar : At forearm or cubital fossa.

II- Palpation

6- Skin sensation :

Loss of sensation at palmar surface of lateral 3.5 finger & loss at palmar surface of lateral aspect of the hand

DIAGNOSIS

As general +

Special tests

(A) PEN TOUCHING TEST :

- The thumb can't be abducted to touch a **pen** in front of it with back of hand on table to avoid action of flexors



(B) PRAYER'S POSITION TEST :

- The tip of the thumb of the affected side touching the palmar aspect of the pulp of the non affected thumb.



(C) OCHNER'S CLASPING TEST :

- The **index** on the affected side is pointed, extended & tapered if the patient is asked to clasp his hands together.
- Due to loss of action of lateral 1/2 of flexor digitorum profundus and lateral 2 lumbricals.



TREATMENT

As general

PROGNOSIS

As general

IV- RADIAL NERVE INJURY

AETIOLOGY

A- INJURY AT THE AXILLA :

- ① Pressure by crutches or chair.
- ② Fracture & dislocation of shoulder.

B- INJURY AT THE SPIRAL GROOVE :

- ① Fracture mid-shaft humerus.
- ② Prolonged application of tourniquet.
- ③ Injection of irritant drug in back of arm
- ④ Falling a sleep with the arm lying across the edge of chair (**saturday- night paralysis**).
- ⑤ Operations in which the out-stretched arm has rested on the edge of the table



EXAMINATION DEPENDING ON SITE OF INJURY

I- Injury at head of radius i.e. Post interosseous nerve injury

- **MOTOR** : Paralysis of all extensors of wrist & fingers
so (**Finger drops deformity**)
no wrist drop because there is weak extension of wrist by brachioradialis & extensor carpi radialis longus.
- **SENSORY** : No changes
because post. interosseous n. (purely motor).

II. Injury at lower 1/3 of arm

- **MOTOR** : As above
+ (**Wrist drop deformity**)
- **SENSORY** : Loss of small area on dorsum of thumb.

III. Injury at spiral groove

- **MOTOR** : As above
+ (**Weak extension of elbow**)
- **SENSORY** : Anesthesia over lower lateral arm & back of forearm.

IV. Injury at axilla

- **MOTOR** : As above
+ (**Complete loss of extension of elbow**)

TREATMENT

As general

PROGNOSIS

As general

V- SCIATIC NERVE INJURY

AETIOLOGY

- ① Wounds, fractures or dislocation of hip
- ② False site of IM injection of drugs.
- ③ It may be paralyzed by pelvic tumors



CLINICAL PICTURE

1- Motor effects

1. Paralysis of **flexors** muscles leading to **dropped foot**
2. Complete paralysis below knee.

2- Sensory changes

Complete sensory loss **below knee** with the exception of skin supplied by saphenous nerve (inner side of leg, inner border of foot & big toe).

VI- LATERAL POPLITEAL NERVE INJURY

AETIOLOGY

- ① Fracture neck fibula or supracondylar fracture femur.
- ② Pressure from plasters or splints.

CLINICAL PICTURE

1- Motor effects

Complete paralysis of the extensors & peroneal muscles leading to **Talipes equino-varus** deformity.

2- Sensory changes

Over the **dorsum** of the foot.

VII- MEDIAL POPLITEAL NERVE INJURY

AETIOLOGY (Rare)

Since the nerve is deeply placed & well protected by the surrounding muscles

CLINICAL PICTURE

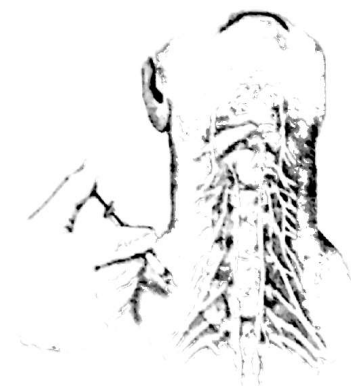
1- Motor effects

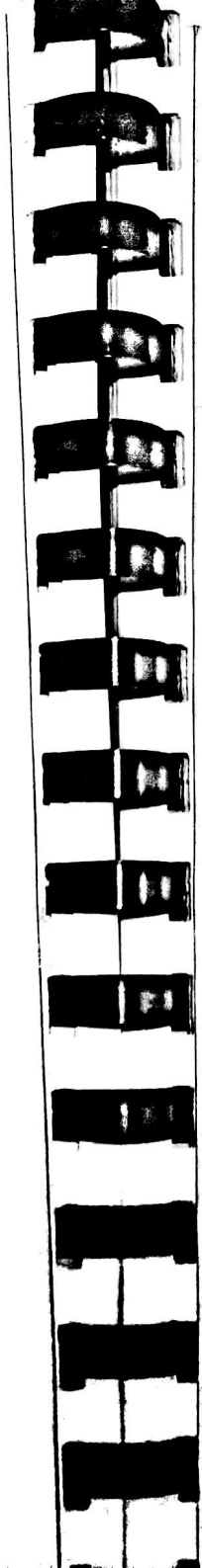
Paralysis of muscles of calf & sole leading to **Talipes calcaneo-valgus** and **clawing** of toes.

2- Sensory changes

Sensory loss over the **sole**

ANESTHESIA





Assessments

I- PRE-OPERATIVE ASSESSMENT

THE PROCESS OF PREOPERATIVE ASSESSMENT IS DONE IN 3 STEPS

1- Outpatient clinic

- Assessment of fitness for operation

1. Fitness for anesthesia : search for ↗

- ① Diseases increasing the risk for anesthesia.
- ② Use of drugs as steroids, anticoagulant, bronchodilators, antibiotics, and psychotropic agents, contraceptive pills

2. Previous operations & anesthetics

3. Allergy & hypersensitivity

- ① Sensitivity to penicillin or iodine-containing substances
- ② Any complications particularly chest, cardiac or renal

4. Alcohol & drug abuse

5. Smoking

- Physical examination This will include :

A. General metabolic status

e.g. Malnourished patients

B. Respiratory system

The preoperative risk factors include the following ↗

- ① Thoracic & upper abdominal surgery
- ② History of COPD
- ③ History of cigarette smoking
- ④ Symptoms of respiratory disease
- ⑤ Abnormal findings on chest radiographs

C. Cardio-vascular system

- a. The presence of congestive heart failure, unstable angina, or recent myocardial infarction requires a cardiac workup before an elective operation
- b. Most patients require echocardiography to determine whether coronary ischemia is reversible.

D. Urinary system

- ① Urine analysis : for sugar, ketones, bilirubinetc.
- ② plasma urea & creatinine

E. Hepatic system

All jaundiced patients & those of a previous history of liver disease, hepatomegaly, splenomegaly, or high alcohol intake requires ↗

- Tests of liver function,
- Tests for circulating hepatitis B & C

F. Neurological system

Patients who are at high risk, such as those with carotid bruits or cardiovascular disease,

- UIS of the carotid arteries to check for stenosis

2- Admission to hospital

On arrival to hospital

- The surgeon checks that the patient notes are complete, result of investigations received.

3- Preoperative round

Done on the day before surgery

⇒ Final examination of the patient :

- Re-examine the patient to ensure finding & ensure that the proposed operation is correct.

- In cases of unilateral condition (hernia, varicose veins ...) the side should be marked.

- Blood should be prepared in case needed for transfusion.

⇒ Instruction to medical staff :

- Urethral catheterization may be required if so, it should be delayed until patient anesthetized.

⇒ Discussion of the procedure :

- Surgeon should discuss the plan of the operation with his team

⇒ Instruction to nursing staff :

- Administer the preoperative medication.

- Operation area has to be shaved immediately before surgery or after induction of anesthesia.

II- PRE-OPERATIVE PREPARATION

SPECIFIC PREPARATIONS

1- Colon surgery

2- Toxic goiter

3- Obstructive jaundice

Mentioned from their chapters

III- PRE-ANESTHETIC ASSESSMENT

PRE-ANESTHETIC VISITOR INCLUDE

1- Full history :

About diabetes, hypertension, drugs to avoid interaction between drugs & anesthetic agents

2- Examination :

(Pulse, blood pressure & teeth to avoid miss of teeth).

3- Revision for investigations

IV PRE-ANESTHETIC MEDICATIONS

- Types of pre-anesthetic medications

1- Sedation

Can be achieved by **Benzodiazepines** or **Opioids** (or both).

2- Analgesia

Can be achieved by IM **Morphine** or IV- **Fentanyl**

• These drugs may cause $\rightarrow$

- Nausea
- Decrease gastric motility
- Biliary spasm

3- Airway secretions/ heart rate

Can be achieved by **Anticholinergics**

4- Prevention of bronchospasm

Can be achieved by continuation of **Anticholinergics**

5- Decrease gastric acidity

Can be achieved by H_2 blocker as **Ranitidine**
or proton pump blocker as **Omeprazole**

6- Decrease Nausea/Vomiting

Can be achieved by **Ondansetron** & avoid nitrous

7- Medications to be continued

- Cardiovascular medication :
 - Such as calcium-channel blocker, beta-blocker, nitrates, and anti-arrhythmic agents should be continued
- Bronchodilator :
 - Should be continued, as withdrawal can precipitate bronchospasm.
- Antiepileptic treatment
- Steroid intake:
 - Sudden withdrawal causes **Addison crises**
- Aspirin :
 - As it inhibits platelet function & is indicated in patients with a history of myocardial infarction and stroke.
It should be continued unless major surgery

8- Medications to be stopped

- Anticoagulants as **Warfarin**
 - Should be stopped at least 4 days before surgery, as these patients are at increased risk of bleeding.
- Contraceptive pills
 - Increase the risk of thromboembolism by increasing the activity of clotting factors.
 - The progesterone only pill need not be discontinued.

Drugs used in Anesthesia

DRUGS USED IN ANESTHESIA



I. Drugs used for induction of anesthesia

Intravenous induction agents

- Intravenous anesthetics are mainly used to provide rapid smooth induction of hypnosis.
- They may also be used as a continuous infusion to maintain anesthesia

So, when used for maintenance of anesthesia

Intravenous anesthetic agents are commonly supplemented with analgesics & muscle relaxants are required

Examples

- 1- Thiopental
- 2- Propofol (Diprivan)
- 3- Ketamine (Ketalar)

II. Drugs used for maintenance of anesthesia

Inhalation anesthesia

They are the most popular agent used for maintenance of Anesthesia when Intravenous access difficult e.g. in children or obese patient volatile anesthetic

Examples

- 1- Nitrous oxide
- 2- Halothane
- 3- Isoflurane

Halothane can be used for inhalational induction of anesthesia

	THIOPENTAL	PROPOFOL (DIPRIVAN)	KETAMINE (KETALAR)
CHEMISTRY	Barbiturates	Non Barbiturates	Non Barbiturates
ADMINISTRATION	I.V & rectal	I.V	IV, oral, IM, nasal spray
DURATION	Short	Very short	Moderate
PROTECTIVE REFLEXES	Suppressed	Suppressed	May be preserved
C.N.S			
• TIMING	Within 30 sec	Within 30 sec	Immediately
• ANALGESIC	Weak	No	Potent
• RECOVERY	Reasonable	Excellent	Poor
• SIDE EFFECTS			
- DELIRIUM	No	No	+ve
- NIGHT MARES	No	No	+ve
- AMNESIA 1 HOUR	No	No	+ve
- HALLUCINATION	No	No	+ve
- I.C.T	↓	↓	↑
- I.O.P	↓	↓	↑
- MUSCLE TONE	↓	↓	↑
RESPIRATORY		Depressed	Preserved
C.V.S		• -ve Inotropic • ↓ BP	• +ve Inotropic • ↑ BP
G.I.T	Nausea & vomiting	Anti-emetic	↑ salivation
HEPATO-RENAL	Transient ↓ of function	Transient ↓ of blood flow	No effect
PAIN ON INJECTION	No	Common	No
COST	Cheap	Expensive	Cheap
USES	① Treatment of status epilepticus ② ↓ I.C.T	① Induction of anesthesia ② Maintenance of anesthesia ③ Sedation during endoscope ④ Sedation in I.C.U	① Short procedures in pediatrics ② Analgesic & sedation
SIDE EFFECT		• Hypotension • Respiratory depression	• Hypertension • Tachycardia

	NITROUS OXIDE	HALOTHANE	ISOFLURANE
NATURE	Gas		Volatile liquid
ANALGESIC EFFECTS	Good	No	Weak
ANESTHETIC EFFECTS	Weak		Potent
ONSET OF ACTION	Very fast	Moderate	Fast
RATE OF RECOVERY	Very fast	Moderate	Fast
ODOR	No	Pleasant	Pungent
USE FOR INHALATION INDUCTION		Good	Unacceptable
MYOCARDIAL DEPRESSION	Minimal	Significant	Minimal
ARRHYTHMIAS	No	++++	No
VASODILATATION		No	+++
HEPATOTOXICITY	No	May occur	No
BRONCHO-DILATATION	No	++++	+++
SKELETAL MUSCLE RELAXATION	No effect	Minimal effect	Potentiate muscle relaxants
COST	Expensive	Cheap	Expensive

III. Post-operative pain control

INDICATIONS

- ① Comfort of patient
- ② Restore function
 - Normal breathing
 - Early movement
- ③ Decrease postoperative complications :
 - D.V.T, pneumonia, lung collapseetc.

TIMING

Start before surgery ending

METHODS

I. Regional techniques

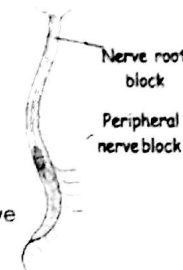
1. PERIPHERAL NERVE BLOCK

a. Block of sensory nerve ending

- **Topical** : Skin or mucus membrane
- **Infiltration** : S.C injection
- **Local intra-venous** : **Lidocaine**

b. Conduction anesthesia

- **Peripheral nerve block** : e.g. Ulnar nerve
- **Plexus block** : e.g. Brachial plexus



2. NEURO-AXIAL BLOCK : (EPIDURAL & SPINAL)

- **Advantage** :
Adequate long lasting analgesia **without** sensory loss.
- **Disadvantage** :
Itching, nausea & vomiting

II. Parenteral analgesics

W.H.O REGIMEN

FOR ACUTE POST-OPERATIVE PAIN or CHRONIC CANCER PAIN

1. Mild pain : Non-opioid " N.S.A.I.D "
2. Moderate pain : **Short** acting opioids
± N.S.A.I.D
3. Severe pain : **Long** acting opioids
± **Short** acting opioids
± N.S.A.I.D

1. NSAIDS

- **Mechanism of action** :
↓ Inflammatory mediators at site of pain
- **Route** : Oral
- **Advantages** :
No respiratory depression
No nausea & vomiting
- **Contraindications** :
 - Bronchial asthma
 - Renal failure
 - Liver dysfunction
 - Peptic ulcer

TYPES OF ANESTHESIA

I- GENERAL ANESTHESIA

General anesthesia entails loss of consciousness, analgesia and muscle relaxation. It entails 3 phases : Induction, maintenance and recovery

Hazards & complications of general anesthesia

1. Fire & explosions
2. Neurological complications.
3. Cardiovascular complications.
4. Respiratory complications.
5. Vomiting & regurgitation.



1- FIRES & EXPLOSIONS

due to the presence of inflammable anesthetic agent as **Ether, Cyclopropane** or **Ethyl chloride** plus a source of ignition as an electric spark, e.g. The diathermy.

2- NEUROLOGICAL COMPLICATIONS

[1] Cerebral hypoxia

CAUSES

- **Hypoxic hypoxia** due to reduced O_2 percentage in inhaled anesthetic mixture or respiratory obstruction.
- **Diffusion hypoxia** as in pulmonary edema.
- **Stagnant hypoxia** in peripheral circulatory failure.
- **Histotoxic hypoxia** due to drug poisoning.

CLINICAL PICTURE

- Mild cerebral hypoxia leads to delay in recovery of consciousness.
- Severe hypoxia can cause cerebral damage & coma.

TREATMENT

- Ventilation.
- Combat cerebral edema by giving dehydrating measures as **Mannitol**
- Hypothermia.

[2] Peripheral nerve palsy

CAUSES

- **Over stretching** due to mal-positioning especially of the upper limb leading to brachial plexus palsy.
- **Compression by the sharp edge** of the operating table causing ulnar or lateral popliteal nerve palsy

[3] Convulsions may occur

Especially in children due to hyperthermia from premedication with **atropine** or use of **ether** anesthesia.

3- CARDIOVASCULAR COMPLICATIONS

[1] Hypertension may be due to

- Light plane of anesthesia & inadequate analgesia.
- Hypercarbia ($\uparrow CO_2$ in blood).
Some muscle relaxants as **Gallamine** or **Pavilon**, or anesthetics as **Ketamine**, or **Cyclopropane**.
- Undiagnosed pheochromocytoma or Co-arcitation of the aorta.

[2] Hypotension may be due to

- Some anaesthetic drugs may cause hypotension.
- Late stages of hypoxia & hypercapnea.
- Hypovolemia.
- Excessive positive pressure ventilation decreases the venous return leading to hypotension.
- Extreme bradycardia.

[3] Cardiac dysrhythmias (Any type can occur)

The main causes are

- Halogenated anesthetics sensitize the myocardium to the action of circulating catecholamines.
- Hypoxia, Hypercarbia & hypotension.
- Surgical manipulation especially during open heart, or gall bladder surgery.
- Electrolyte imbalance.
- Endocrine disorders as in thyrotoxicosis.

[4] Circulatory arrest = (Cardiac arrest)

See 1st cardiac arrest & its management.

[5] Pulmonary and systemic embolism

4- RESPIRATORY COMPLICATIONS

Cyanosis under general anesthesia

CAUSES

1- RESPIRATORY OBSTRUCTION MAY OCCUR AT ANY OF THE FOLLOWING SITES :

- **Pharynx :** *Due to* backward falling of the tongue during recovery due to relaxation of the jaw.
It is treated by holding the jaw forwards and insertion of an oro-pharyngeal airway.
- **Larynx :** *Due to* laryngeal spasm. The precipitating factors include irritant anaesthetic vapors, extubation, presence of secretions & vomiting.
It is treated by oxygenation under pressure
- **The trachea & bronchi :**
Due to profuse secretions, sputum, foreign body, vomiting or kinking of the tube.
It is treated by proper suction & oxygenation.
- **Alveoli :** *Due to* pulmonary edema 2nd to heart failure.

N.B: Signs of respiratory obstruction :

- ⇒ **With spontaneous respiration :**
Noisy breathing, absent breath sounds, ↓ chest movement with forced expiration
- ⇒ **With controlled respiration :**
increased pressure to inflate the lungs
(i.e Resistance to inflate the lungs).

2- RESPIRATORY DEPRESSION MAY OCCUR DUE TO :

- Depression of the respiratory centre by narcotics & analgesics.
- Incomplete recovery of the respiratory muscle from the effects of muscle relaxants.
- Metabolic disorders as uremia & diabetes mellitus.
- Hypothermia.

TREATMENT

A- PROPHYLACTIC :

- ① Maintain a free airway by an endotracheal tube.
- ② Enough O₂ to support the patient.
- ③ Avoid over dose of premedications or anesthetics.

B- CURATIVE :

- ① Remove the cause
- ② Ventilate with O₂ until cyanosis disappear

5- VOMITING & REGURGITATION

Regurgitation is a passive process due to muscle relaxation.

Vomiting may occur during recovery from anesthesia.

PREDISPOSING FACTORS

- ① Full stomach.
- ② Increased intra abdominal pressure due to abdominal distention, ascites or tumors.
- ③ Intra-abdominal manipulations during surgery.

SEQUELAE

- ① **If mild** it will lead to laryngeal spasm.
- ② **If severe** it may cause severe hypoxia & cardiac arrest.
- ③ **Late** pulmonary infective complications.

PREVENTIVE MEASURES

- ① The patient should have an **empty** stomach by fasting for **6** hours before elective operations.
- In **Emergency situations :**
a large stomach Ryle tube is passed before induction.
- ② **Inhalational anesthetics used for induction** may cause vomiting and should be avoided if there is a possibility of vomiting.
- ③ **An endotracheal tube** should always be used to protect the airway from possible vomits.
- ④ **During recovery** a strong sucker is ready and the head is lowered so that no gastric contents can reach the airway.



TREATMENT

IF VOMITING OCCURS

THE FOLLOWING STEPS SHOULD BE PERFORMED :

- Lower the head of the table.
- Good suction.
- Oxygenation.
- IV hydrocortisone.
- Antibiotics are administered.
- Bronchoscopy if necessary.



II- LOCAL (REGIONAL) ANALGESIA

TYPES OF LOCAL ANALGESIA

1- Surface analgesia

By local anaesthetic spray, or cream. It is used for mucous membranes as the mouth, pharynx, larynx or urethra.

2- Local infiltration analgesia

This entails local injection of the anaesthetic in the subcutaneous tissue to block the sensation in a localized area or to produce field block.

3- Nerve block

This means local injection of the anaesthetic in the neural sheath around a peripheral nerve.

4- Plexus block

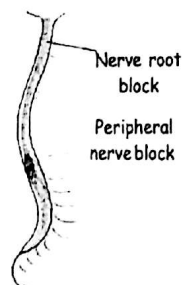
This is performed by injection of the local anaesthetic in the neural sheath around the nerve plexus (brachial plexus or lumbar plexus).

5- Nerve root block

The local anaesthetic is injected either in the epidural space or in the subarachnoid space.

6- Local intravenous analgesia

It is used in the extremities after application of a tourniquet.



CONTRAINDICATIONS TO LOCAL ANALGESIA

- ① In children under 10 years.
- ② In psychotics.
- ③ Non co-operative patients.

COMPLICATIONS OF LOCAL ANALGESIA

1- Complications due to the technique

- ① Intra vascular injection.
- ② Injury to adjacent nerves or blood vessel.

2- Complications due to local anesthetics

- ① **Central nervous system** : stimulation followed by depression .
- ② **Cardiovascular system** : Hypotension
- ③ **Respiratory depression** may progress to apnea due to medullary depression or respiratory muscle paralysis.
- ④ **Allergic reactions** lead to bronchospasm, urticaria & skin rash.

3- Complications due to combined Adrenaline with local anaesthesia

- ① Marked tachycardia, hypertension & heart failure if suddenly absorbed in vascular areas.
- ② If used for ring block as in fingers, toes & penis, gangrene may result.

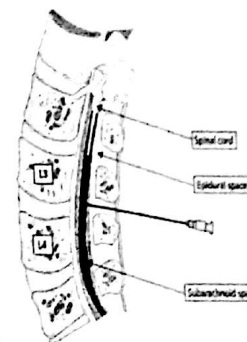
III- SPINAL ANESTHESIA

ADVANTAGES

- ① It is simple & easy to be performed.
- ② It gives adequate muscular relaxation.
- ③ It reduces bleeding (induced hypotension).
- ④ It does not interfere with cardiac, hepatic or renal functions.

CONTRAINDICATIONS TO SPINAL ANESTHESIA

- ① **Local sepsis** in the lumbar region
- ② **Deformities** of the spine as kyphosis.
- ③ **Previous operations** in the lumbar spine region e.g. laminectomy operation.
- ④ **CNS diseases** such as disseminated sclerosis & progressive muscle atrophy
- ⑤ **Patient refusal.**
- ⑥ **Extremes of age** as very young or very old patients.
- ⑦ **Neurological or psychological** disturbances for medico-legal causes.
- ⑧ **Patients receiving anti-coagulants.**



MECHANISM OF SPINAL ANESTHESIA

The position

- 1- The patient is usually positioned in a sitting posture on the operating table.
- 2- The forearms can be made to rest on thighs to make the patient stable & comfortable,
- 3- Alternatively procedure can be performed with the patient lying on his side with his hips and knees are maximally flexed.



The procedure

- 1- The anesthetist will clean the back using anti-septic solution .
- 2- He may administer a little bit of local anaesthesia to numb the skin over the point where the spinal anaesthesia will be given as the spinal needle may produce some pain
- 3- The anesthetic solution is then injected through the needle into the spinal space usually between L₃ & L₄ but may vary from patient to another
- 4- After successful administration, the patient will be positioned as required & all his parameters will be checked by the anesthetist .

1. Early complications

1- VASO-VAGAL ATTACK :

⇒ Fainting, sweating, hypotension and bradycardia in sensitive patients.

TREATMENT

- ① Reassurance.
- ② Putting the patient in the recumbent position + I.M. Atropine.

2- FAILURE OF SPINAL ANESTHESIA.

3- SENSITIVITY TO DRUGS:

⇒ Leads to convulsion + severe cardio-respiratory depression.

TREATMENT

- ① Proper ventilation by O₂ mask or even endotracheal tube + mechanical ventilation.
- ② Support the cardiovascular system is vital.

4- SPINAL SHOCK :

AETIOLOGY This is due to

- ① ↓↓ venous return as a result of peripheral pooling of blood in the dilated blood vessels below the level of spinal block,
- ② Loss of muscle tone → peripheral stagnation of blood.

CLINICALLY

⇒ Sweating, bradycardia, hypotension, nausea & vomiting, CNS irritability and chest tightness.

EARLY DETECTION

⇒ A.B.P should be monitored every 5 minutes during the 1st 20 minutes during spinal anesthesia.

TREATMENT

- ① Immediate trendlenburg's position to ensure adequate blood supply to the brain & heart.
- ② Oxygen inhalation.
- ③ Vasopressor drugs as Ephedrine 25 mg slowly by I.V. drip.
- ④ Atropine 0.2mg I.V.
- ⑤ I.V. fluids up to 2 litres of ringer's lactate.

5- TOTAL SPINAL ANESTHESIA :

⇒ This occurs when the anaesthetic drug travels high up in the sub-arachnoid space leads to paralysis of intercostals muscles & diaphragm leads to APNEA.

TREATMENT

Endotracheal intubation + respiratory support

6- NAUSEA & VOMITING may be due to

⇒ Hypotension, hypoxia or surgical traction on the mesentery of intestine.

TREATMENT

- ① Correction of the cause
- ② Anti-emetic is given.

7- SHOOTING PAIN IN THE LEG

⇒ Due to touching of one of nerve roots by the spinal needle.

8- SUDDEN DEATH :

⇒ Rarely occurs when a thick needle is used → sudden drop of C.S.F. pressure → brain stem conization at the foramen magnum.

2. Late complications

1- POST - SPINAL HEADACHE :

⇒ This is the commonest complication occurring during the 1st 2 - 3 days following spinal anesthesia.

⇒ There are 2 types :

A. Hypotensive headache

- Due to dural puncture by thick needle or multiple punctures → C.S.F. leak → ↓↓ pressure.
- The patient gets severe headache on raising his head, while he gets relief by lying flat.

TREATMENT

- Analgesics, high salt & fluid intake + I.V. saline.

B. Hypertensive headache Rare

- Due to chemical irritation by anaesthetic drugs → ↑↑ production of C.S.F.
- Headache is increased by lying flat & relieved some what by sitting

TREATMENT

- Analgesics

2- MENINGITIS :

⇒ Fever, severe headache, neck rigidity. lumbar puncture is diagnostic.

TREATMENT

- Antibiotics + analgesics.

3- BACKACHE due to traumatic lumbar puncture.

4- NERVE PARALYSIS : due to

- ① Cauda equina lesion.
- ② Paraplegia.

5- ACUTE URINE RETENTION :

It occurs in the 1st 24 hours post-operative due to prolonged paralysis of S₂, S₃ nerves.

